POPULAR WIRELESS WEEKLY, OCTOBER 20th, 1923. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

WE HAVE THE LARGEST WIRELESS CIRCULATION.

# Popular Wireless

PRICE 3d. EVERY FRIDAY.

No. 73. Vol. IV. SCIENTIFIC ADVISER: SIR OLIVER LODGE, F.R.S., D.Sc. October 20th, 1923.

The Aunts and Uncles of 2LO at Burnham Beeches (See article inside).

## FEATURES IN THIS ISSUE.

Talks on Crystals (No. 1).
A New Microphone.
Progress Due to the Amateur.
Page of Practical Ideas.
An Interview with the Inventor of the Coherer.
"How I Installed a Wireless Set." By Alfred Lester.

# GECOPHONE

## Important Announcement

## Substantial Reductions in Price

The invaluable experience gained by the G.E.C. during the past year in meeting the unprecedented demand for GECOPHONE Sets has resulted in reduced manufacturing costs, and this, combined with the lower B.B.C. tariffs, has enabled the following substantial reductions in prices to be made as and from October 1st, 1923.

| | OLD PRICE | NEW PRICE | |
|---|---|---|---|
| No. 1 GECOPHONE Crystal Set | £5 10 0 | £4 10 0 + 1/- | B.B.C. Tariff |
| No. 2 „ „ „ | 9 15 0 | 7 10 0 + 1/- | „ „ |
| 2-Valve „ Set ... | 25 0 0 | 20 0 0 + 17/6 | „ „ |
| Single Stage Amplifier ... | 7 0 0 | 5 10 6 + 5/- | „ „ |
| Two Stage Amplifier ... | 13 10 0 | 11 10 0 + 10/- | „ „ |

The same superlative quality that has characterised the manufacture of GECOPHONES since their inception will in every way be maintained.

**OBTAINABLE FROM ALL WIRELESS DEALERS**

*Manufacturers (Wholesale only):*

**The GENERAL ELECTRIC Co., Ltd.**

**MAGNET HOUSE, KINGSWAY, LONDON, W.C. 2**

*Branches in all the principal towns throughout Great Britain and in all important markets of the world.*

REG. TRADE MARK. REG. TRADE MARK.

**We are exhibiting at the N.A.R.M. Exhibition at the White City, Nov. 8 to 21.**

BUY BRITISH GOODS ONLY

# POPULAR WIRELESS

THE WIRELESS WEEKLY WITH THE LARGEST CIRCULATION.

October 20th, 1923.] SCIENTIFIC ADVISER, SIR OLIVER LODGE, F.R.S., D.Sc. [Every Friday.


## TOPICAL NOTES AND NEWS.

**Overheard in Church.**

FIRST Whisper: "How much did you put on the plate last Sunday morning, Bobbie?"

Second Whisper: "I put fifty volts on the plate and got him loud speaker strength."

* * *

**A New Circuit.**

THE other afternoon I looked into the office of the Technical Editor of "P.W.," to find him enjoying a concert from Radiola via a loud speaker. I was very much struck with the clarity of the reception, and asked him what set he was using, at the same time making close observation. I regret I cannot tell you what it is, for I was out of the room in a very short space of time. I believe, however, our Technical Editor has devised another circuit, and readers may rest assured that they will hear all about it in due course.

* * *

**Esperanto and Wireless.**

A TALK, entitled, "The Only Cure for a Tongue-tied World," will be broadcast from 2 L O next Saturday by Mr. John Merchant, president of the British Esperanto Association.

* * *

**Professor Fleming.**

A COURSE of six lectures will be given by Professor J. A. Fleming at the University of London, beginning October 24th, at five o'clock. The lectures will be on "Ionic and Thermionic Valves." The course is open to a limited number of students. A syllabus of these lectures, and particulars as to fees can be obtained on application to the Secretary, University College, London, W.C.1.

* * *

**A Coming Event.**

ON the thirty-first of this month the Hon. William R. Warren, Prime Minister of Newfoundland, will broadcast from 2 L O, an address on "Newfoundland." The Hon. Warren made the wittiest speech at the dinner of the Imperial Colonial Institute, and I shall look forward to his forthcoming address with interest.

* * *

**Retailers' Association.**

THE Wireless Retailers' Association strongly approves the report of the Broadcasting Committee, and strongly disapproves of the rejection of some of its most vital recommendations. It is of the opinion that a Government department has no power to determine the issue between Free Trade and Protection.

31, Cintra Park,
Upper Norwood, S.E. 19,
September 23rd, 1923.

The Editor,
"Popular Wireless,"
The Fleetway House, E.C. 4.

Dear Sir,

I have recently completed Unit One of the "P.W." Combination Set, and am very pleased with the results of same. With an aerial of 22 ft. only, on the top floor of this house, clear and fairly loud reception is obtained from 2 L O on an Amplion Junior Loud Speaker, while I have also been receiving Newcastle and Glasgow B.B.C. Stations on 'phones. I should think that a circuit capable of the above, considering the conditions, is a credit to its designers.

Yours faithfully,
JAS. B. LAW.

**Irish Radio Association.**

PROFESSOR W. J. LYONS was recently elected president of the Radio Association of Ireland, at a general meeting in the wireless department, Technical Institute, Kevin Street, Dublin.

* * *

**No Rush!**

I AM surprised to learn there has been no rush on the Post Office for licences. Probably when it has become more generally realised that the committee has at last issued its report, and constructional licences can now be obtained, things will speed up a little.

* * *

**Breach of Promise Case.**

A LAWYER on a breach of promise case in America:

"But couldn't you let me have some of his letters?"

Fair Client: "There weren't any; we both had radio sets."

**Tablet Crystals.**

CRYSTALS for wireless sets will shortly be available in tablet form. This has been made possible by an idea patented by a Fulham chemist who has adapted to wireless a process common in chemistry. By breaking down a crystal and feeding it into a compression machine, he converts it into small tablets.

* * *

**The Virtues of the Tablet.**

HE has tested the resultant "crystal" on a set, and finds that it works perfectly.

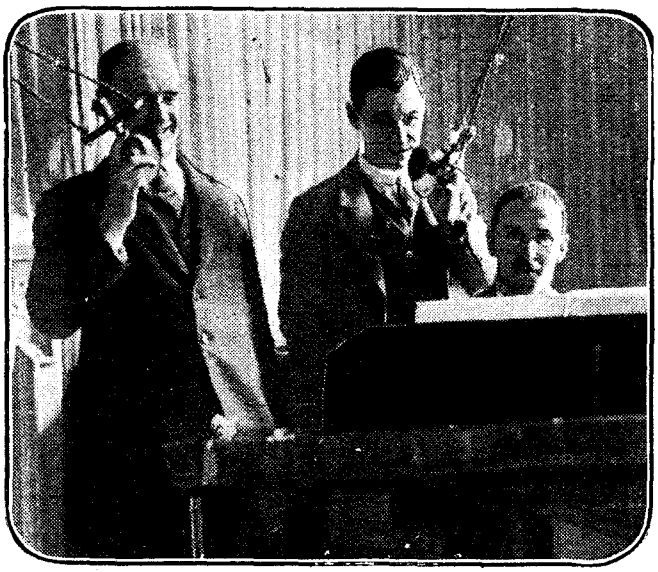
The virtues of the tablet are mainly that it is simple to mount, cheaper to produce, gives complete contact, and can be replaced by others of exactly the same size.

* * *

**After Dinner Speeches.**

I AM told that broadcasting banquet speeches like those made by the notabilities at the Royal Colonial Institution is likely to add to the popularity of listening-in. I doubt it, for probably when you haven't shared the banquet, speechmaking is apt to prove a trifle "indigestable."

* * *



"Uncles" Jack, Will, and Nick of the Newcastle Broadcasting Station.

**From America.**

TALKING of "indigestion," I am reminded of a story told me some time ago by an American "fan." During a dinner a well-known man was to give a speech which was to be broadcast, but, owing to him having dined well and not too wisely, his speech was interrupted by "indigestion." After the dinner my American friend told him that his speech was broadcast, and it would be necessary to give some excuse for his "indigestion." "Yes," he replied, "tell 'em atmospherics were bad." This incident happened before America went "dry."

* * *

**Arctic Listening-in.**

WHEN the Merton College Expedition to Spitzbergen returned, Mr. F. G. Binney, the leader of the expedition, said that a wireless set was carried to contribute to the amusement of the explorers. There was great excitement when the listeners-in heard the playing of the National Anthem, dance music, and the "Good-night" from one of the British broadcasting stations.

* * *

**Aberdeen Station.**

THE Aberdeen broadcasting station has increased its wave-length to 495 metres by permission of the P.M.G.

(*Continued on page* 238.)

# NOTES AND NEWS.

(*Continued from page 237.*)

This will give amateurs living near a broadcasting station a chance to tune out their local transmission and hear what is going on up north.

* * *

**Bombay.**

THERE seems to have been some misunderstanding with regard to the statement that 2 L O has been heard in Bombay. Inquiries show that the Marconi Company are unaware of any such development, and it is suggested that the station which was heard in India was Leafield (Oxford), which transmits news in addition to Government messages. This certainly sounds more feasible.

* * *

**Organ Recital to be Broadcast.**

THE great interest aroused by the organ recitals at Westminster Cathedral has led to a request being made by the British Broadcasting Company for permission to broadcast one of them. Arrangements have been made for the transmission of a recital which is to be given early next month.

* * *

**An Aerial "Hitch."**

2 L O's aerial was pulled down the other day for some slight repair during the Children's Hour, and this delayed the Uncles' chat to their nieces and nephews for half-an-hour. They soon made up for lost time, however.

* * *

**"Romeo and Juliet."**

THE inclusion by 2 L O of such a large company as that necessary for "Romeo and Juliet," which was broadcast recently, was really creditable, and it could not have been under better supervision than that of Captain C. A. Lewis, who worked hard the whole evening. We must not forget Mr. Stanton Jeffries, the musical director, who, under many difficulties, succeeded in conducting the special augmented orchestra with great success. After the performance Uncle Jeff was congratulated by all who took part in the evening's performance.

* * *

**Forgotten!**

ONE man, an engineer, of whom no one took any notice whatever, was responsible for fifty per cent of the success of the opera. He, Mr. Litt, was the man who made simultaneous broadcasting possible, and I heard that he was in the building when I arrived at the studio, but that he had locked himself in the control room, so that no one would deter him from his important work.

* * *

**A Delay.**

THE fourth act of "Romeo and Juliet" was delayed by Mr. William Anderson and myself, who were outside chatting to one another when the time came for Mr. Anderson to "go on." Both our watches differed, and it was eventually agreed that we should go by Mr. Anderson's watch, with the result that, as both watches were slow, Uncle "Cactus" had to fish us out of the waiting-room.

* * *

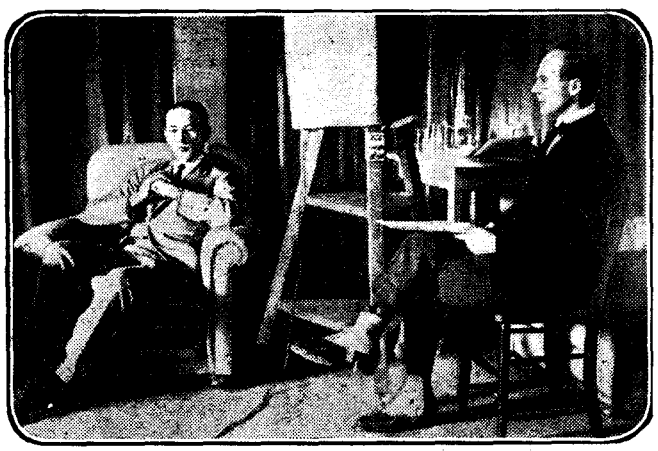
**Swedish Wireless.**

THE status of broadcasting in Sweden is a curious one: the Government has decided that transmitting stations will be constructed by the State, but will be leased to operating companies. Receiving stations may be constructed by private persons, if they first obtain a licence from the Government.

**BROADCASTING TRANSMISSIONS.**

Regular transmissions of news and concerts take place daily from the following stations. Full details appear in the daily Press.

| | | | |
|---|---|---|---|
| LONDON ... | 2 L O | 369 | metres. |
| BIRMINGHAM ... | 5 I T | 420 | ,, |
| MANCHESTER ... | 2 Z Y | 385 | ,, |
| NEWCASTLE ... | 5 N O | 400 | ,, |
| GLASGOW ... | 5 S C | 415 | ,, |
| CARDIFF ... | 5 W A | 353 | ,, |
| BOURNEMOUTH | 6 B M | 410 | ,, |
| ABERDEEN ... | 2 B D | 495 | ,, |



Mr. K. A. Wright, 2 L O's new announcer, and (right) Mr. Rex Palmer.

**Talks from 2 L O.**

MONDAY, OCTOBER 22ND.—7.15 p.m. Mr. John Strachey, "Literary Criticism." 9.10 p.m. Captain N. D. Riley of the Natural History Museum, "Butterflies and Moths."

TUESDAY, OCTOBER 23RD.—7.15 p.m. Mr. Raymond Parks of Messrs. Carter Page & Co., "Autumn Gardening." 9.10 p.m. Mr. E. H. Blake, Secretary of the Auctioneers' and Estate Agents' Institute, "How to Become an Auctioneer."

WEDNESDAY, OCTOBER 24TH.—7.15 p.m. Mr. Archibald Haddon, "Dramatic Criticism." 9.10 p.m. No talk owing to the simultaneous Manchester transmission.

THURSDAY, OCTOBER 25TH.—7.15 p.m. Mr. Percy Scholes, "Musical Criticism." 9.10 p.m. Mr. Anthony Bertram, Official Lecturer to the National Portrait Gallery, "Historical Portraits."

FRIDAY, OCTOBER 26TH.—7.15 p.m. Mr. G. A. Atkinson, "Cinema Criticism." 9.10 p.m. Dr. A. C. C. Crommelin, F.R.A.S., Director of the Comet Section British Astronomical Association, "Comets."

SATURDAY, OCTOBER 27TH.—7.15 p.m. Mr. Allan Baddeley, "The Day's League Football." 9.10 p.m. Captain Richard Twelvetrees, "Motoring."

* * *

**Some Items from 5 S C.**

FRIDAY, OCTOBER 19TH.—A short Talk by Dr. Gunn of Edinburgh, on "Practical Education as Affecting the Cottage Industry." Mr. Robert Murray, Entertainer at the piano. Miss Rhoda Graham, Contralto. A Talk on "Rugby in the Schools," by Dr. J. H. Steel, Headmaster of Allen Glen's School, Glasgow.

SATURDAY, OCTOBER 20TH.—The Victoria Male Voice Quartet. Miss Winifred Scott, Soprano. 9.0 p.m. Simultaneous Broadcast of Talk by Col. C. D. Crisp, "The Humours of Football."

* * *

**Opening of Aberdeen.**

THE opening of the Aberdeen station on the 10th was a great success from the point of view of simultaneous broadcasting, though at times there were interruptions due to the ordinary land-line telephony trunk calls.

* * *

**Reception of 2 B D.**

BY the way, talking of Aberdeen, have you noticed how well that station's transmission come in down in the south of England and round about London? It is often easily audible on two valves (H.F. and Det.).

* * *

**A Schoolboy's Licence.**

AT a meeting of the British Broadcasting Co., held at the Cannon Street Hotel, Mr. F. Lloyd, who was till recently in charge of the Sheffield Relay Station, proposed that there should be another licence issued for schoolboys.

* * *

**Mr. Lloyd's Scheme.**

HE told me after the meeting that his scheme was that school children should be able to apply to their teachers for a licence, and that as the majority have but little pocket-money, they should pay 1s. per week until 5s. is paid, this being the value of that licence. The headmaster or mistress should get the licence for the boys from the Post Office.

* * *

**Did you Spot It?**

BY an extraordinary coincidence, and quite innocently on the part of our draughtsman, one of the diagrams in the first "P.W." gift supplement, "The 'P.W.' Combination Set," includes the outlines of two faces. These are passing resemblances to two very well-known pugilists, and the outlines present an incongruous position. No prizes are offered for the locating of the diagram in question!

* * *

**Was He "Bona-Fide"?**

SOON after the broadcasting report was issued, it is said that a P.O. official called at a private house, and asked to see the telephone. When informed that this instrument had been removed, he asked to see if the wires had been left in order. When he was admitted into the house he inquired whether a wireless set was installed. The reply was "yes," and to the surprise of the occupier the "G.P.O. official" presented him with a catalogue dealing with wireless apparatus.

* * *

**"War" Against Pirates.**

THE Post Office has prepared amendments to the Wireless Telegraphy and Signalling Bill, which is designed to regularise the present position. If the amendments are approved by Parliament, it will make the position of the "pirate" distinctly uncomfortable.

**ARIEL.**

# AN INTERVIEW WITH THE INVENTOR OF THE COHERER.

By "ARIEL."

**In this exclusive interview with Dr. Edouard Branly, the well-known French scientist, "Ariel" gives an interesting pen-picture of the man who first made the reception of wireless signals possible.**

A HOUSE in the shadow of the Palais du Luxembourg: an old rambling house in the heart of the Latin Quarter of Paris.

It was here that I met Dr. Edouard Branly and passed a most interesting and engrossing afternoon discussing wireless. Dr. Branly is, perhaps, a name familiar to few British readers, but in France it is one valued and held in as much esteem as is that of our Sir Oliver Lodge.

It was Dr. Edouard Branly who first made wireless communication possible by introducing a practical detector, or, as it became better known later on, a coherer, and it was in that same house that he invented this instrument.

The whole of the ground floor is fitted up as a laboratory, a long, sombre room, fully sixty feet in length and half as wide. Thick trees outside prevent the entry of sunlight through the windows, and the laboratory is inexpressively gloomy.

A small electric light over a bench in one corner of the room provides the only illumination. I discovered later that many of the instruments in the room had been made by Dr. Branly himself in an adjoining workshop.

### Devoted to Science.

When I had picked my way along a dark corridor and successfully avoided a confused jumble of coiled wire and strips of metal, I came upon Dr. Branly busy at a bench. In front of him was a galvanometer, connected to a long perpendicular rod by means of numerous strands of wire. Dr. Branly was absorbed, but when I endeavoured to obtain details of the particular experiment on which he was working he waved my questions aside, and with a pleasant smile said:

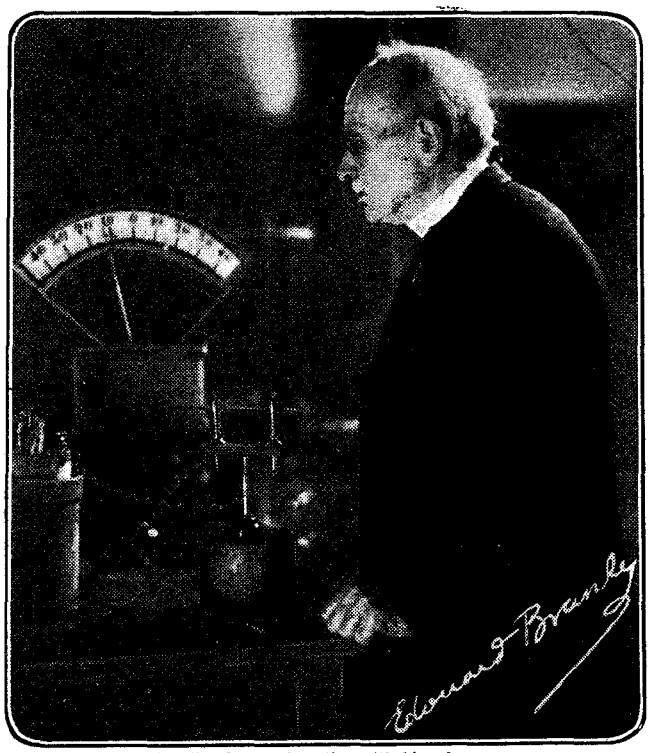
"You must wait until I have pursued it a little further."

We conversed entirely in French, and I was much struck with the large number of technical words and terms that were identical to those we use. I remarked upon this and the doctor said:

"Yes, it is in a way curious. Not only in wireless matters do we convert and use English words, but in many other things, too. Particularly in sport. We now have 'le football,' 'le tennis,' 'le knockout,' and numerous other words of fairly modern introduction. I should not be surprised if 'le broadcast' came into everyday use in France."

I naturally asked Dr. Branly if he had read POPULAR WIRELESS or "Wireless Review and Science Weekly." "No," he replied, "I have not. You see, the whole of my life has been devoted to science, and I have never found time to study languages. I do know, however, that Sir Oliver Lodge, that famous scientist, is the Scientific Adviser of your journals. Sir Oliver is very well known in France, and many of his books and articles have been translated. His work in the interests of wireless is wonderful. I hope one day to have the great pleasure of meeting and talking to him."

Looking back into the gloomy space of the laboratory, I said to the doctor:




**Dr. Branly experimenting with his coherer.**

"This room has witnessed some important experiments and researches, I feel sure."

"Ah!" he said, rather sadly, "it has grown old as I have done. The instruments are not so good as I should like. It has, perhaps, lost its air of tidiness and modernity. I was born a very short distance from here, and began to devote myself to science in 1869.

### Co-operation with Marconi.

"In 1873 I was made a Doctor of Science, and in the same year started to study medicine earnestly. I passed my examination in 1882 and became a Doctor of Medicine. Then I turned my activities to telegraphy and worked year after year in this laboratory, at this very same bench. It was in 1899 that the work bore fruit. That, as you know, was the year I discovered the coherer. It was the coherer that was used by Senator Marconi when he first began operations in London."

At this juncture the doctor reached up to a shelf, took down a black tin box, and, after a search, handed me a letter. It was from Senatore, then Signor Marconi, and dated March 29th, 1899.

The letter paid tribute to the splendid work of Dr. Branly that had made some recent experiments give such fine results.

"The coherer," the doctor continued, "was used as a means of detection for a number of years. It seemed to make a big stride forward in wireless telephony. That period of my life, when I was in communication with Signor Marconi, was one of the busiest and happiest."

I handed the letter back to the doctor, and asked him whether it was his intention to continue the line of research that had produced the coherer.

"No," he replied. "There is now no further use for my invention. Valves are superior."

"Then perhaps you will conduct experiments with valves?" I continued.

"No," he said. "Under present conditions I cannot. This laboratory, large as it is, is not sufficiently well equipped. The instruments you see here would not be of any use for delicate experiments with valves.

### Need for Further Research.

"I am not wealthy enough to install modern apparatus and rebuild this laboratory. Then, again, there are now hundreds of experts working on the improvement of wireless. I am afraid I am now too old to start experiments. Enthusiastic as I am, I feel I cannot keep pace with younger, more virile, scientists."

"You have help in your work here, have you not?" I said.

"Yes," he replied, "I have one or two workmen, but it is my very earnest desire to find a keen young student who would work with me and continue my experiments when I retire.

"It is brains I want, not money. The help of a man who is ever eager to improve and develop wireless telephony."

It was at this stage that I caught sight of a weird-looking apparatus arranged on a table near one of the windows. It was like no other instrument I had ever seen, and my curiosity forced me to ask what it was.

With a fine old-world courtesy he piloted me across the littered floor in order that I might make a closer inspection. Pointing to various parts, he described what they were and what were their functions.

"You see," he said, "it is as yet unfinished, but when it is complete I hope it will tell me what takes place between the gap of the coherer electrodes. More I cannot tell you at present, but later I will give you full details and results."

It was with a feeling of great regret I said "Good-bye." A more charming, interesting man would be hard to find. In spite of the disadvantages of his laboratory, his keenness was undiminished. He is one of the men to whom listeners-in all over the world owe gratitude.

# WIRELESS IN THE WOODS.

**By Capt. RICHARD TWELVETREES, A.M.I.M.E.**

**Describing the recent outing of the Junior Car club, during which wireless demonstrations were outstanding features.**

ONE of the most important wireless events of the year took place at Burnham Beeches on Sunday, September 30th, and was held under the auspices of the Junior Car Club, whose activities are best known to the general public in connection with the annual motor race of 200 miles at Brooklands.

Thanks to the kind invitation of the committee, I was invited to take part in the affair at Burnham Beeches in a sort of official capacity; at least, they adorned my arm with a formidable-looking brassard, displaying the word "Marshal." This entitled me to the doubtful privilege of asking too curious spectators to "Keep on the other side of the ropes, please," but also permitted me to wander unmolested to the place where the doings were going on.

**One of the demonstration vans which provided music via two large loud speakers.**

### Rival Demonstrations.

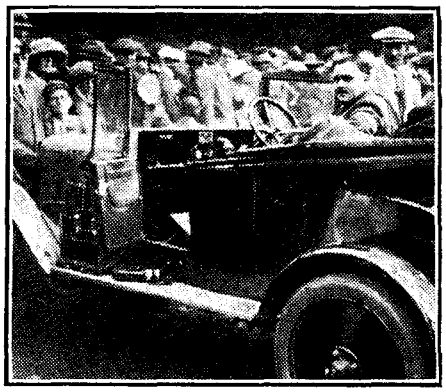
Knowing my weakness for things connected with motor-cars, the organisers lent me a light car, fitted out complete with a set and loud speaker.

As it had been announced that the "Uncles" would appear in force, their arrival in a big Daimler saloon car caused a buzz of excitement amongst those who had long looked forward to seeing them in the flesh, and very soon cameramen, kinema operators, and autograph collectors were busy plying their shutters, handles, and notebooks.

In accordance with instructions, I started to fix up the aerial of the set fitted to my car, and carefully unwound the reel on which the wire was coiled. Two or three small and inquisitive children got entangled in the aerial, but they were extricated by the kind services of a policeman, and fastening a spanner on the end of the wire, I made a cast to attempt to fix it in a tree. Unfortunately, I have not been used to fly-fishing, and so the cast was not successful and the spanner came back with a boomerang effect, but the second cast saw the wire safely fixed to one of the branches.

As it happened, the volume of the crowd made it impossible to do any real good with the small sets fitted to the cars, so the programme was eventually sent out from the two powerful sets fixed to motor lorries. Whether the absence of all the Uncles from 2 L O made any difference or not I do not know, but at first the transmission was decidedly on the weak side, and it was not until Capt. Eckersley dashed off in a car to the nearest telephone to tell them to put more ginger into it, that the listeners got the necessary volume of sound. Then the concert came through very well indeed, and people who were several hundreds of yards away heard everything quite as clearly as they would have done on their own sets at home.

An enterprising firm of wireless specialists had seized this opportunity of showing off their wares, and a small motor lorry, fitted out with a business-like aerial, wandered in amongst the other motor vehicles. Personally, I could not get near enough to it to see who or what it was, but they certainly deserved to do some business for helping to broadcast to such an historic gathering. The presence of the rival faction proved too much for the engineer in one of the other small cars, and after a struggle he got through the crowd and going a little way into the wood, started a demonstration on his own. If rumour is not false, I believe he firmly established the superiority of his set over the one fitted in the lorry of the enterprising visitor.



**The author in the light car mentioned in the article.**

### A Wayside Concert.

On my way back from the gathering I made up my mind to have a little wayside concert, and reaching Wimbledon Common at about 8.30 p.m., I again did the aerial cast and got the apparatus fixed up just out of the wave-length of a policeman on point duty. I am not quite sure of the legality of wayside concerts in regard to obstruction, but the temptation was too strong to resist, so I got on to 2 L O and treated a fairly large crowd to an impromptu programme. The concert was not impromptu, but the method of distributing it certainly was.

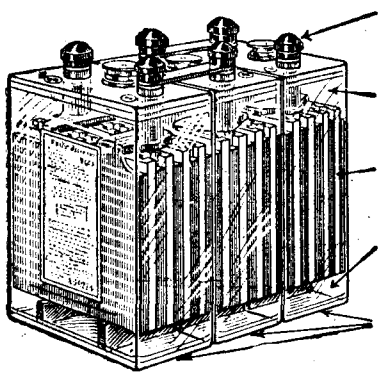
On this occasion, I discovered the real advantages of the wonderful little set on the car, and even though the night was inclined to be cold and misty, the interest of the instrument prevented me from continuing the journey until there was no more music in the air.

**An interesting photograph showing the dense crowds that gathered to hear the music from 2 L O.**

# Exide

## THE LONG LIFE BATTERY.

# *Huge price reductions*


Non-corrodible terminals.
Extra space above top of plates.
Wood separators prevent frothing.
Large mud space prevents short circuits.
Each cell a separate unit.

| | 4 Volt | | 6 Volt | |
|---|---|---|---|---|
| | *old price* | *new price* | *old price* | *new price* |
| CZ3 | ~~34/-~~ | 27/- | ~~51/-~~ | 40/6 |
| CZ4 | ~~40/-~~ | 32/- | ~~60/-~~ | 48/- |
| CZ5 | ~~46/-~~ | 37/- | ~~69/-~~ | 55/6 |
| CZ6 | ~~52/-~~ | 42/- | ~~78/-~~ | 63/- |

## Exide Batteries Do Not Froth on Charge.

Ask for New Price List giving Reductions In All Types.

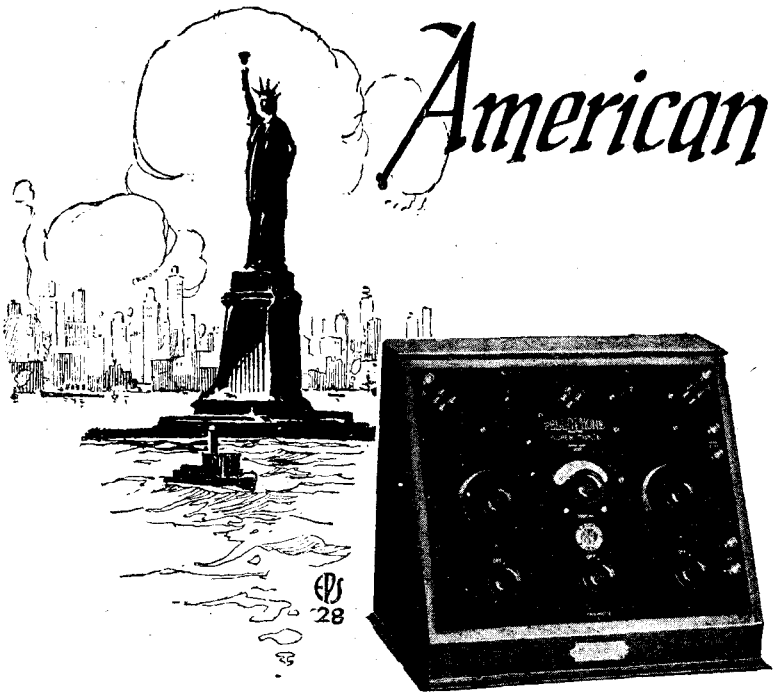
**Obtainable from all Dealers and Garages, and 350 Service Agents.**

THE Chloride ELECTRICAL STORAGE COMPANY LIMITED.

Exide BATTERIES SERVICE STATION

HEAD OFFICE & WORKS: CLIFTON JUNCTION, NR. MANCHESTER.
LONDON: 219-229, Shaftesbury Avenue, W.C.2.
BIRMINGHAM: 57-58, Dale End.
MANCHESTER: 1, Bridge Street.

**Use Chloride Batteries for House Lighting.**




# American Broadcasting

**received with a standard Fellophone Super 2**

EXTRACT FROM LETTER.

"*Long Melford,*
"*Suffolk.*
"*September 22nd, 1923.*

"*This morning from 1 a.m. I received the whole programme transmitted from W G Y, General Electric Coy., New York, with the addition of your 2 valve amplifier. One or two of the items were coming through so loudly that I removed the amplifier, and received one or two songs, etc., on the 2 valve Fellophone only. One song item transmitted, 'Asleep in the Deep,' being perfectly audible. This I consider marvellous on 2 valves. I have received American telephony on several occasions, and can always get them when I get up for the purpose, so that it is not a freak reception.*"

(Signed) ALFRED WOOD.

The original of this letter may be seen at

THE FELLOPHONE "SUPER 2." Complete with H.T. Battery, Accumulator, 100 ft. 7/22 stranded copper aerial, 2 Insulators, 1 pair "Light Weight" Headphones.

The "Super 2" Amplifier, specially designed for Loud Speaker work with this Set.

Valves, B.B.C. and Marconi Tax Extra.

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*Advt. The Fellows Magneto Co., Ltd.*

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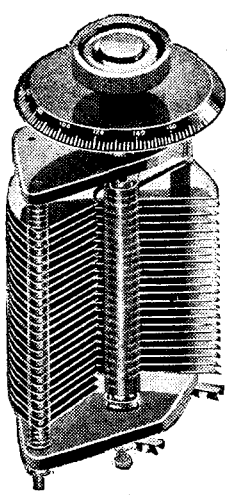
THE **J.B.** **PRECISION VARIABLE CONDENSERS**

BRITISH MANUFACTURE.



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**Owing to the ACCURATE CLOSE SPACING these Instruments take up much less room in Panel.**

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These Condensers are being used by leading makers of sets, who after severe test for best results have given their preference to the **J.B.** which is **YOUR GUIDE TO REAL SATISFACTION.** They are unconditionally guaranteed to be scientifically correct, mechanically perfect, and built for unusual durability.

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**Admiralty, War Office, and India Office Contractors.**

# HOW I INSTALLED A WIRELESS SET.

**By ALFRED LESTER**

**The famous comedian describes the troubles and mishaps that overtook him when he tried to probe into the mysteries of wireless.**

"COMPLETE Wireless Set—£2—including Book of Instructions." It sounded cheap, so I copied the address from the advertisement, which I saw on a sheet of "The Ironmonger's Magazine" that had blown over into my garden.

I'd often heard the milkboy telling my housekeeper about the "listening-in set" he had fixed up—why shouldn't I have one? So I sent off the £2, and sat by the front window waiting for it to arrive.

Mr. Alfred Lester.

I had frequently read the broadcasting programme in the daily papers, and I thought a clever man like Mr. Marconi should be encouraged. I'd read that at 11.30 every morning someone sings a song; that appealed to me. What could be more enjoyable than to sit after breakfast while your egg is digesting listening to an anæmic tenor warbling "Come into the Garden, Maud"? Far nicer than reading about murders.

Then perhaps you might hear some learned professor lecture on "The Habits of the Earwig." They also tell you what the weather is going to be if it's fine; and I've sometimes read that they tell you what to have for dinner, and how to turn yesterday's cold rice pudding into a pêche Melba. You are told exactly when it is twelve o'clock, and that's very handy.

### Preparations.

I never know the right time in my house, as all my clocks seem to have their own ideas as to what the time really is. Of course, I've got an eggboiler, but it takes too much time to keep on turning it up again each time the sand has run through, and then I am liable to lose count how many times I've turned it and get late for tea.

After waiting two days, the wireless set arrived. It was packed in a nice box, so I thought if the contents were no good the box would make a cosy kennel for the dog, anyway. I thought I had better open it in the garden, in case it exploded, so I took it out and stood it on the rhubarb bed (I call it a rhubarb bed, though really it is a rockery).

I had a bit of a job to get the lid off the box, and broke two hammers in doing it. It was on nice and tight, and there were twenty-eight nails to keep it on. I found out afterwards that I'd stood the box the wrong way up and taken the bottom off. The real lid only had three nails in it!

The inside of the box looked like a birds' nest to me. It was full of a kind of moss, and when I saw four round white shining things I thought they were the eggs, and they'd sent me an incubator by mistake; but when I looked at the instruction book I found the "eggs" were called "insulators," and the moss was what is known as "packing."

### Complications.

I threw all the moss on the grass, and then took out a coil of wire. It *was* a coil. It looked to me more like the mainspring of Big Ben. It got so much mixed up with my feet that I had to take my boots off to untwist it, and I thought I might get electrocuted any moment. While I was busy with my feet the dog was playing with one of the insulators, and knocked it down the garden drain, so that did that in. Then I fished out a small box arrangement with black doorknobs on and a heap of little screws. These I put on the path.

Then I came across a sort of pillbox marked "Cat Whisker," and this started the dog barking. As soon as I had got the bits nicely laid out in the garden it came on to rain, so I got my housekeeper to come and hold an umbrella over the lot while I went indoors to fetch another hammer. When I came out again I found she had shovelled them all up and put them in the coal-scuttle, so I decided to leave it over till the morning.

I took the book of instructions to bed with me and read how to do the fixing up until about 3.30, and then went to sleep; but suddenly woke about five all over electric shocks; but I found out afterwards it was cramp, and nothing to do with the wireless at all.

It distinctly said in the book: "Great care must be taken in fixing the aerial from the roof of the house to a post." This was rather awkward, as the roof of my house is on a slant. I got my housekeeper to give me a "bunk up" through the bath-room window so that I could reach the stack-pipe. I got hold of it and gave it a tug, but I must have tugged too hard, for it came away in my hand. So we took it indoors, and now use it as an umbrella stand. This was the first time in my life that I wished I had been born an acrobat.

At last I got on the roof—well, I got my hands and face on—and I pulled up the rest of me later. As I was embracing the chimney-pots a man passing by shouted up to me: "What are you going to do with them chimneys—kiss 'em?" I didn't take any notice of him, but selected a good-looking chimney-pot and clung hold of it, with a hammer in one hand and a pair of pliers in the other.

I lost the pliers. I suppose I must have dropped them down the chimney, for the next time I saw them was in my Irish stew I had for dinner, which was standing on the hob while I was on the roof. At last I got the aerial fixed—well, one end of it.

I managed to crawl back through the bath-room window, but in doing so, trod on the soap and nearly broke my leg. When I got down from the roof my face was so dirty my dog flew at me. I think he mistook me for the dustman. I then tied a couple of clothes' props together and nailed them to the side of the greenhouse. (I put my foot through the greenhouse twice, but that didn't matter as it was raining, and it saved me the trouble of watering the musk.)

Then I went indoors to get some more wire, and when I came out again I found my housekeeper was pegging the washing on to my aerial wires. I couldn't say anything as I had used her props. Then I was told to get an "earth" wire, so I stuck a bit of wire in a flower pot and nailed it along the kitchen floor.

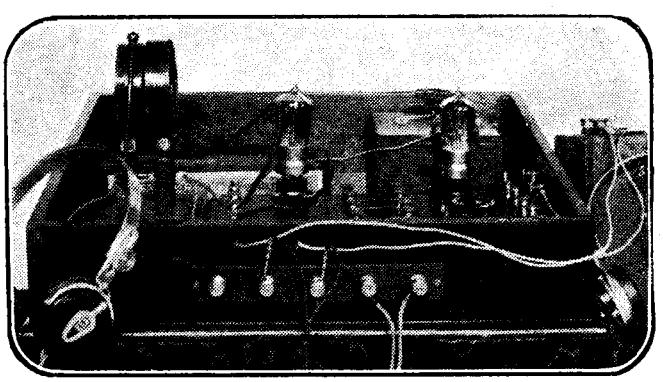
I then made two holes through the wall into the dining-room—one to put the wire through, and the other to see where I was going. I was anxious to get my wireless all in order, as my Aunt Jane was coming the following evening, and I thought it would be a little treat for her, as she suffers so from the earache.

### Realisation.

I had decided to have my listening-in set close to the window, so that passers-by should see that I had one. I suggested to my housekeeper that instead of going to the Pictures she might stay at home and listen-in, and pay me the ninepence. At last I got all fixed up, and she and I started to listen-in. I only had one set of earphones, so I broke it in halves so that we could both listen-in at the same time.

It was exactly 7 o'clock when we started, which was the time for a flute solo to be broadcast from Marconi House. We both listened and distinctly heard music, and exclaimed, "Wonderful!" We heard "The Bluebells of Scotland," there was no getting away from it.

Suddenly the music stopped. I happened to look out of the window, and there stood a man in the gutter with a tin whistle! I have not heard from Mr. Marconi from that day to this, and if anybody wants to buy a good listening-in set cheap, drop me a line, and they can have the lot for seven-and-six.



**A portable two-valve set built by Mr. P. Dale, 133, Francis Road, Leyton, E.10.**

# AN INTERESTING SALISBURY STATION.

**By Lieut. W. Ison, R.E., A.M.I.R.E.**

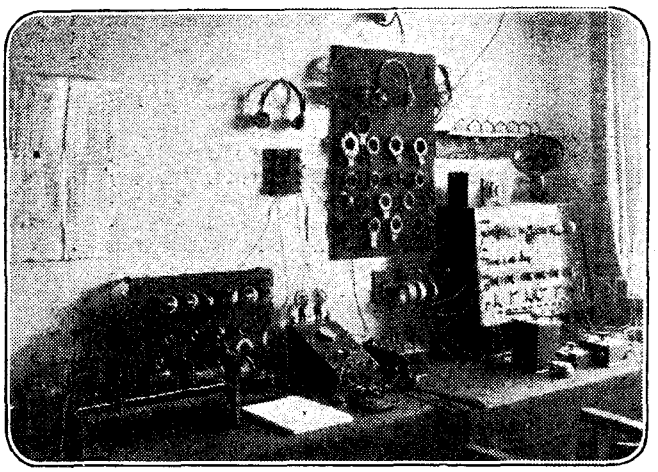
**This interesting description of the well-known amateur station, 2 F B, gives the reader a good idea of the amount of work entailed in the upkeep and operation of an efficient transmitting plant.**

THE photograph on this page is of the author's receiving and transmitting station at Salisbury.

On the right may be seen the six-valve receiver, which consists of two high-frequency valves (transformer coupled but easily changed to tuned anode coupling), one detector, and three low-frequency valves. It is rather too elaborate to be fully described here, but it has switches enabling any combination of from one to six valves to be used. It is extremely powerful, and Glasgow has been heard well on one valve.

On the top may be seen the loud speaker and special loading coil, and above them the valve rack. On the left of the panel is the three-coil holder with various condensers in front. Immediately to the left of the coil holder is a small one-valve set of the author's own design which gives exceptionally good results. It can be converted into a Flewelling receiver by a switching device.

Next to that is a two-valve low-power transmitter working off direct current mains. It is of the choke control type, and has been used with great success for giving demonstrations from the house and concerts at fêtes in the neighbourhood. On the left again is an experimental six-valve panel enabling any type of circuit to be connected up in a few moments.



A view of the interior of 2 F B, Lieut. W. Ison's efficient amateur station.

Unfortunately, the room is so constructed that only about one-half of the bench could be shown on the photograph, so that a number of other types of receivers and amplifiers cannot be seen.

The aerial used is of the twin inverted "L" type on 6 ft. spreaders 30 ft. high, each end, the lead-in being almost directly over the operating-room.

The earth is to a water pipe, but there is also a counterpoise aerial which is occasionally used in place of the earth. The direction is north and south, directional south, and an indoor aerial is also fixed. Under the bench is a rotary converter used for charging batteries, and another high-tension generator is shortly to be installed. At present, for greater power than 200 volts, banks of dry cells are fitted in series with the mains.

Transmission takes place every Sunday morning from about 10 to 1 with various stations in and around Wiltshire, and although in this part of the world jamming from French coast stations and Channel shipping is very fierce, results are reported as uniformly good. Transmission even on 200 metres is not carried out during broadcasting hours, because complaints have been received that on that wave-length local reception from Birmingham is sometimes interfered with.

# Talks on Crystals

## 1 CARBORUNDUM.

CARBORUNDUM being the first type of crystal to be employed for radio purposes, it is perhaps only fit that it should be given the premier place in this series of talks on crystals. Over fifteen years ago, when the infantile science of wireless was struggling for commercial recognition and existence, it was the discovery and utilisation of the rectifying properties of carborundum that released wireless telegraphy from the drastic limitations and uncertainties of the coherer and magnetic detector, and almost at one bound effected what perhaps might be called a "radio revolution." The introduction of the crystal detector, and, at a later date, of the thermionic valve, are epochs in the history of wireless, and it is to the rectifying properties of the carborundum crystal that the first successful and practical application of the former is due.

Carborundum, as is well known, is a carbide of silicon. Its chemical formula is represented by the symbols "SiC."

Crystallised carborundum is manufactured by fusing a mixture of fine sand and coke in an electric furnace. The temperature which is often attained in furnaces of this type is estimated to be somewhere in the region of 3,500 degrees Centigrade, which is about the highest practical temperature attainable on this earth. Massive carbon electrodes are used for conveying the current on account of their infusible nature. The mixture of sand and coke is packed into the space between the electrodes. A little salt is also added to make the mass more fusible, and sometimes a small quantity of fine sawdust is mixed with it to render the molten product more porous, and thus to allow the produced gases to escape.

After the furnace has been filled the current is turned on and allowed to heat the entire mass for a period of eight hours. Then when the operation is over and the furnace has cooled down sufficiently, the brickwork sides are removed, and the product is treated with hot acid to dissolve out the impurities. Almost pure carborundum remains.

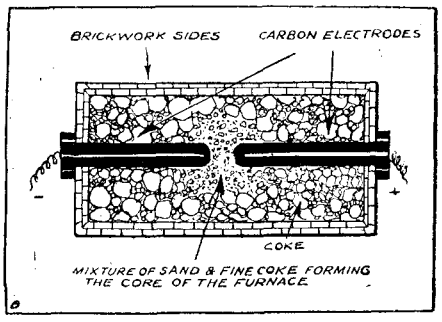
### Local Potential Necessary.

When fairly pure, carborundum crystalises in hexagonal plates, which vary considerably in colour. In some cases they may be almost colourless, but generally the crystals are darkly coloured. The steel-blue varieties are usually the most sensitive for purposes of wireless reception.

Carborundum is not attacked by any acids—not even by the highly corrosive hydrofluoric acid, which so easily eats into glass. Before it can be attacked or decomposed in any way, a crystal of carborundum must be fused at a high temperature with strong caustic alkalies.

Despite the fact that its successful use in wireless reception requires the application of a local potential, carborundum still finds a steady employment in crystal detectors. The great feature of the carborundum detector is, of course, its stability, and on this account such detectors can be used for portable and marine sets where the employment of the cat's-whisker type of detector would be utterly useless.

The construction of a carborundum detector is so well known that it need not be described here. It is sufficient to observe that the best metallic contact for use with a carborundum crystal is a flat steel spring applied with a steady pressure which may amount to as much as 2 or 3 lb. The potential required is generally in the neighbourhood of 1·2 to 1·5 volts, and it may be obtained with the aid of a series of dry cells, such as a flash-lamp battery




contains, and a potentiometer. The carborundum detector may not be as sensitive as some of the other crystal rectifiers, but on account of its great stability it has long been a favourite for serious crystal work.

# Manufacture of Broadcasting Apparatus

## USE OF PATENTS

The pioneer work of the Marconi Company in connection with wireless telegraphy and telephony is well-known and, as the result of many years of research work and considerable expenditure, the Company controls numerous patents relating to the manufacture or use of wireless telegraph and telephone apparatus.

The Company is prepared to grant a licence for the use of its patents in connection with the manufacture of broadcasting apparatus to any member of the British Broadcasting Company, Ltd.

A large number of firms (including the principal manufacturers) are already so licensed and pay royalty for the use of these patents, and all apparatus manufactured under licence is so marked.

Any persons or firms manufacturing or offering for sale valve apparatus embodying patents controlled by Marconi's Wireless Telegraph Company, Ltd., without its permission, render themselves liable to legal proceedings for infringement.

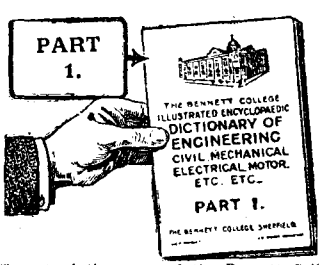
Whilst hoping that it will not be forced to take legal proceedings the Marconi Company wishes to give notice of its intention to protect its own interests and those of its licensees, and in cases of infringement the Company will be reluctantly compelled to take such steps as may be necessary to defend its patent rights.

## Marconi's Wireless Telegraph Co., Ltd.,

**Marconi House, Strand, London, W.C.2.**



# FREE

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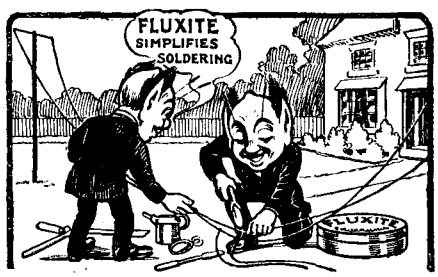
# A VITAL SPOT.




AMONGST the hundred-and-one little intricacies and whatnots of an amateur wireless installation, there is one spot that is of vital importance to the receptive qualities of the whole outfit—such an innocent little spot that even the more ardent enthusiast is inclined to overlook it. It is the connection of the aerial leads to the aerial, the connection that must hold tight in all vagaries of the weather as well as convey the infinitesimal electric current to your instrument. Twisting the connections together is all very well, it serves—for a while—yet, where is the sailor who would think of mooring his ship to a bollard by tying the rope in the same sort of bow that you would tie your shoe-lace? So much for the moral.

Give the attention to your set that you wish it to give, and solder each connection carefully with the aid of FLUXITE, and above all that vital spot—the aerial leads.

Ask your Ironmonger or Hardware dealer to show you the neat little

## FLUXITE SOLDERING SET

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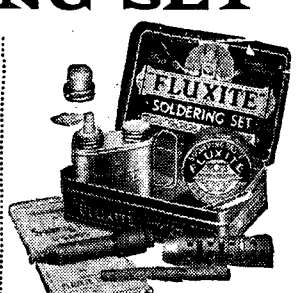
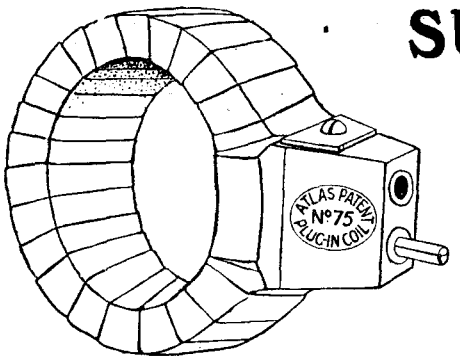



For the tool kit of your car or motor-cycle, or any soldering jobs about the home.

**FLUXITE LTD., 324, Bevington St., Bermondsey, England.**

# "ATLAS" PATENT PLUG-IN COILS STAND SUPREME




Maximum Inductance. Each Turn and each Layer of winding **Air-Spaced.**

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*Radio Components Catalogue on Request.*

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A comparison of these wavemeter readings with those of any other make of coil will reveal the undoubted superiority of the "ATLAS" Coil over all others.

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|---|---|---|---|---|
| | Min. | Max. | | |
| 25 | 120 | 375 | 5 | 0 |
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| | Min. | Max. | | |
| 250 | 1280 | 4150 | 9 | 0 |
| 300 | 1550 | 4940 | 9 | 5 |
| 400 | 2045 | 6380 | 10 | 3 |
| 500 | 2980 | 8900 | 10 | 6 |
| 600 | 4000 | 12100 | 11 | 0 |
| 750 | 4970 | 15000 | 11 | 10 |
| 1000 | 6100 | 20000 | 12 | 8 |
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When you are tired of wasting both time and money on so-called Wireless Crystals, secure one of the new Super Marvel Crystals

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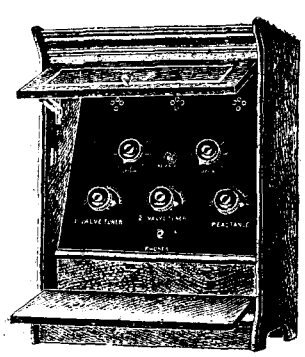
# For £4:10:0 you can assemble the Acme 2-Valve Receiver.

By far the cheapest way for the amateur to get a highly efficient set, capable of receiving messages of 150 miles' distance, is to assemble this Acme set, which will be sent carriage paid, with simple instructions for **£4:10:0.**

The set here illustrated is the Acme 3-valve, price **£15:16:6** complete with H.T. batteries (royalty **£4:2:6**); or with valves, 'phones, accumulator, and aerial equipment **£21** (royalty **£4:2:6**).



**The Free Catalogue** describes these two and other sets at various prices, as well as many distinctive Acme accessories.

*Write for it to-day.*

**BUY BRITISH GOODS ONLY.**
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**The Acme Production Co Ltd**
**Smethwick**
**Birmingham**

# Artistes of the Aether

BY "ARIEL"

Some of the artistes who have given you pleasure while listening-in"

NOTWITHSTANDING that pessimists tell us the public has tired of its new scientific toy, it is evident that "wireless" is still being taken seriously, and in a critical spirit. This was demonstrated at a recent concert, when the "announcer," having used the popular pronunciation of the British Empire Eisteddfod, with the accent on the I, was promptly rung up by a Cardiff listener-in and informed that the correct sound was with a short "e," and therefore Esteddfod.

Mr. Lyell Johnston.

One good point of the British Broadcasting Programmes is the abolition of the need for the old "top-liner," or star-turn. Wireless has proved that it is not always the artiste with the big name (and corresponding salary) that gives the most successful results over the aether. There is boundless opportunity for the newcomer, as executant and composer, and the B.B.C., though still making many mistakes, have certainly opened the door to the younger generation, who could not wish for a larger audience, nor one more appreciative if their work is good.

### How Choir Experience Helped.

One of the singers who has been heard with admirable results is a clever young baritone, well known also on the stage and concert platforms as Theodore Hughes. In a recent "chat," Mr. Hughes said that he owed his early training to his father, Mr. Frederick Belchamber, F.R.C.O., the organist and choirmaster of St. Gabriel's, Willesden Green, and it is probable that Mr. Hughes' early experience as solo choir boy has given him the ability to pitch his voice so well.

Mr. Robert Parker.

Subsequently he trained with the well-known ballad singer, Thorpe Bates, and after that became a member of Mr. George Dance's Company in "Tom Jones," singing the title rôle and winning golden opinions. Mr. Hughes' own favourite part is the Duke of Ariosto in "Arlette," and it certainly gives him good scope. But he has devoted more time lately to concert work, and he is well known at Queen's and the other big London concert halls, as well as in the provinces. Over the aether, Mr. Hughes' songs gave complete satisfaction, and he will be warmly though silently welcomed when next he appears before the microphone.

### A Versatile "Star."

Lyell Johnston is another star of the aether whose voice is a familiar one to most listeners-in, and much of his success lies in the fact that he introduces the human note into his songs and stories, imbuing them with a genial friendliness that carries them straight to the hearts of his audience. Mr. Johnston is an artiste who has plumbed every depth of his profession. As an author and composer his songs have been sung by others as well as himself all over the country. As an actor, his latest part was in the Offenbach Follies at the London Coliseum; as a singer, he has toured the provinces, and been heard in every big London hall: and now, as a professor at the Guildhall School of Music, in addition to his own work as singer and elocutionist, he is paving the way to success for many embryo artistes. Mr. Johnston, too, is to be remembered for the work he did in the Great War, when he was responsible, in his capacity as organiser and hon. musical director of the Soldiers' Entertainment Fund, for the arrangement of nearly 3,000 hospital concerts. By these he not only afforded abundant pleasure to the men, but provided work for some six hundred fellow artistes hard hit by the war Not a bad record this!

Mr. Leonard Hirsch.

Speaking generally, there are few successful women entertainers. Whether it is that the gentler sex do not possess as keen a sense of humour or lack the power to "carry over," is an open question, but the fact remains that the time-honoured jokes against mothers-in-law and eggs, accompanied by a few chords on the piano, are usually perpetrated by the mere male. The British Broadcasting Company, however, have been successful by their past engagements of Miss Helena Millais, a well-known favourite, and of the Scottish elocutionist, Miss Maud Couper.

### A Successful "Humouriste."

Scotland is reckoned fair game for the would-be humorist, and if he can only get in some story relating to the tragedy of a lost "saxpence," he is safe, he thinks, to raise a smile. But Miss Couper works on different lines. She has succeeded firstly in bringing elocution to a fine art, and has justly won fame in Scotland for her treatment of Scottish humour of the "pawky" kind, and not of the brand known as "grinning through a horse collar." Miss Couper has recited also at the Albert and Queen's Halls, and is always a favourite at London Scots gatherings.

Few operatic singers have had wider experience than Mr. Robert Parker, now of the British National Opera Company. He has literally sung all over the world. During a recent interview, some interesting facts were gleaned from him. Starting originally in opera in America, he subsequently joined the Quinlan Opera Company, and went on two tours through England, thence to South Africa, Australia, and Canada. After that came Covent Garden with the Beecham company, followed by long tours in Australia and America with Dame Melba.

Miss Maud Couper.

Mr. Parker admits that out of the sixty-one different rôles enacted by him, he prefers Hans Sachs in "The Meistersingers," and certainly it is one that "radiod" most successfully.

### On the Orchestral Side.

On the orchestral side of radio, one of the most successful leaders is Mr. Leonard Hirsch, at the Manchester station. Into his twenty years of life, he has already crowded the experience of a lifetime, and he promises to continue one of Manchester's leading violinists, with a wide career in front of him.

He has been playing concertos with orchestras since the age of fourteen, and came to Manchester in 1918 to complete his studies. Here he took the John Webster Memorial Exhibition, and was sent by the Manchester Royal College of Music to represent them last July at the Patrons Fund Rehearsal, when he played Lalo's Spanish Symphony with the Royal Albert Hall Orchestra. Mr. Hirsch is also a member of the Hallé Orchestra, and has been with the British Broadcasting Company since March, when he formed the original Radio Trio, the first of its kind to be broadcast, and gradually formed the orchestra now known as the 2 Z Y Orchestra

Mr. Theodore Hughes.

# PROGRESS DUE TO THE AMATEUR.

**In a very interesting address Dr. Eccles outlines the amateur's part in the progress of wireless, and reveals the debt that the commercial designer owes to non-professional skill.**

AN amateur, I take it, is a person who is fond of the subject for its own sake, and not for what he gets out of it. Within the scope of this definition, especially as applied to wireless, there are all sorts of persons (said Dr. Eccles, opening his presidential address to the Radio Society of Great Britain on September 26th).

We may say that when following any study or hobby, any amateur in any subject is obeying an impulse towards making something; he is answering the call of the creative instinct. But the older forms of hobby have a great difference from the type of hobby that we follow, because they make mere copies of real things, which are usually extremely inefficient and incapable of practical application. Therein is a great contrast with wireless. The apparatus of the wireless amateur is practical apparatus.

From the instant that he first tunes up his receiving apparatus and listens-in to all the world's telegraphic traffic crossing sea and land and the boundaries of different countries, he comes into close contact with the practical telegraphic world. This fact, taken together with the circumstance that he is using full-scale apparatus, ensures that there is a perpetual flow of improvements and suggestions from the amateur fraternity into the practical world as regards wireless methods and apparatus.

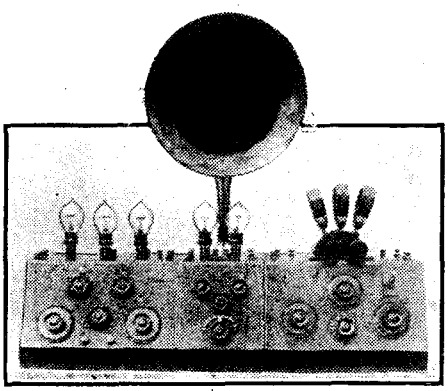
### Early Wireless Amateurs.

We may say that many of the great advances in wireless have been initiated by the amateur, and that most of the early steps in the inception of the subject were taken under the stimulus and guidance of men who were neither telegraphists nor engineers, but merely lovers of the infant science. Before wireless became commercial all the workers in it were amateurs; they were experimenting in ignorance of the vast commercial future before it, and were studying it without thought of gain. Sir Oliver Lodge's work with the short aerial, on waves a few metres long, using the filings coherer with the tapper, back in 1894, constituted the first complete wireless receiving set ever assembled, and was certainly done "for fun." It was an aside from his laborious scientific work in the laboratory and in the study; in fact, he probably set it up to amuse people.

One may say also that until about 1897 Marconi was an amateur making experiments with Hertzian waves, as were a great many people in the various physical laboratories and lecture-rooms throughout the world, and Rutherford's open-air experiments with his own magnetic detector in 1896, when he received signals across Cambridge, a distance of a mile and a half, were done without thought of pecuniary recompense. It was the amateur who brought forward the crystal detector, who found out the best combinations, who introduced it into our subject. It was some time after this work by the amateur that the crystal detector came gradually into practical commercial telegraphy.

Again, in 1913, a young American student, E. H. Armstrong, working with wireless circuits because he loved them, produced the first auto-heterodyne receiver using the audion, and staggered all the professionals and commercial experts of the world by demonstrating in New York the reception of transatlantic signals, inaudible otherwise. Finally, when the war came, the amateurs penetrated in their hosts into the armies, and turned their wireless experience and their talents to the design, construction, operation, and improvement of apparatus for use in war.

Broadcasting as it is to-day is indebted to the amateur for its existence. In America the broadcasting movement was started by amateurs and their clubs and societies giving gramophone concerts and other entertainments to their fellow amateurs. In this country a similar movement took place, but was limited to smaller dimensions by the restrictions which were an aftermath of the war. It is not unreasonable, however, for the amateurs to claim that their previous presentation of



**This home-made set demonstrates the amateur's ability to construct handsome and efficient instruments.**

the case smoothed the way for the inauguration of the British Broadcasting Company and its large scheme of eight powerful stations.

### Popular Programmes.

If we try to see what the future contains, by looking at America, France, Germany, the Argentine and other countries where broadcasting is in operation, we find that, sometimes in one country, and sometimes in another, there are commercial exchange prices being broadcasted, stock quotations, in some cases sporting and general news and racing results, and in other cases political orations in addition to entertainments. If broadcasting develops in this country from the entertainment or instructional side which it exhibits at the present time, and takes up all these items, it is quite possible that it will become as necessary to the community as the Press. If that is so, it may become even more influential than the Press, because hearing is very much easier to most people than reading, and because the voice carries personality.

In future, too, the kind of programme may be very different, and the kind of programme will have a considerable effect upon relations between broadcasting as an industry or as part of social life, and the amateur. Up to the present the Broadcasting Company has maintained a very high standard, and has broadcast the highest class of music and very interesting and instructive literature. The items are greatly appreciated by the present clientèle, but the future clientèle may be very different. It may be more numerous; if it is more numerous it will be more humble on the average. A foretaste of the kind of comment that will come when things too good for average life are put on the broadcast was given us the other day, when the British Association Presidential address was sent forth all over the country. According to some of the newspapers, the complaint in nearly every home was that there was too much Rutherford; but it is a fact, and we must admit it, that you cannot run a daily paper on choice extracts from the poets and essayists. Bach and Beethoven will not suit everybody. In fact, I can imagine that, rather than hear Bach and Beethoven, many people will prefer constant repetitions, with strong affirmation, of the fact that we have no bananas.

### Congestion of the Ether.

Probably the most immediate problem that the amateurs have to think about is the allocation of the wave bands. The increase in the number of broadcasting stations will demand that an increased wave band shall be set aside for broadcasting. It follows that there will be less space left in the spectrum for the amateur, and we, as amateurs, ought to take on the whole problem of preparing a case to be put before the authorities, whenever they require to hear us, in order that we may set forth our views and put them in proper form for exerting due weight. It is conceivable that in default of some such preparation on the part of the amateur fraternity, the allocation of wavelengths to them for their use in transmission experiments may be too narrow or even nil. This, I think, will be very harmful to the study of every section of wireless, but especially to the study of transmitting apparatus, and therefore ultimately to the industry.

In what I said earlier I pointed out that wireless telegraphy was originated by amateurs who were neither engineers nor telegraphists, and that wireless development since then has owed as much at least to the amateur experimenter as to the trained technician. The presence of a large amateur wireless section in a population ensures that that community will be receptive to new ideas in wireless and produces an environment in which the highest form of technician can flourish. As a consequence, men of special ability are afforded adequate scope, and genius is discovered and given its opportunity. When it is remembered that one inventor or genius, like James Watt, may be worth untold millions to the world, we feel the importance of encouraging to the utmost the spread of the amateur spirit in wireless as in other branches of our modern electrical civilisation.

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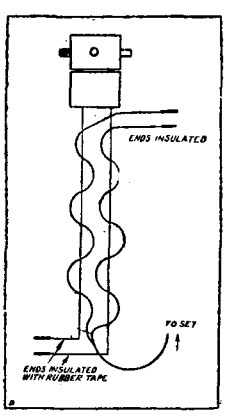
# PRACTICAL IDEAS *for the* AMATEUR.

## ELECTRIC LIGHT MAINS AS AERIALS.

IT is frequently convenient to be able to use the electric light mains as an aerial.

This can be very simply done by means of two pieces of twin flexible wire, each about four yards long.

One wire of each pair is connected to an ordinary B.C. adaptor, as shown in sketch, suitable for plugging into the electric light fitting. The other ends of each of these wires are carefully insulated with rubber tape. There will thus be an adaptor to which two wires are connected, the opposite ends being insulated.



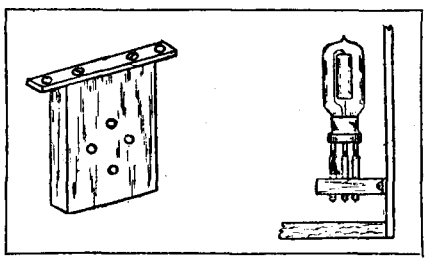

The ends of the other two wires (one in each twin) adjacent to the adaptor should be similarly insulated, and the ends remote from the adaptor joined together and connected to the aerial terminal of the set. The ordinary earth connection is of course required.

By this means the normal current in the supply mains is prevented from reaching the set, whilst the small capacity provided by the twisted wires permits of the passage of the H.F. currents set up in the mains by the passage of the wireless waves.

## VALVE MOUNTING FOR PORTABLE SET.

PORTABILITY means compactness, at least as far as receiving sets are concerned, and the little idea illustrated below shows how a valve may be enclosed in the cabinet of a receiver. A piece of $\frac{1}{4}$ in. or $\frac{3}{8}$ in. sheet ebonite about $2\frac{1}{4}$ in. long by $1\frac{1}{8}$ in. wide, is fitted with a brass flange, as shown in the upper illustration, and provided with four holes in which the valve sockets are fitted. The flange should be $2\frac{1}{4}$ in. long, and firmly screwed to the top edge of the ebonite.

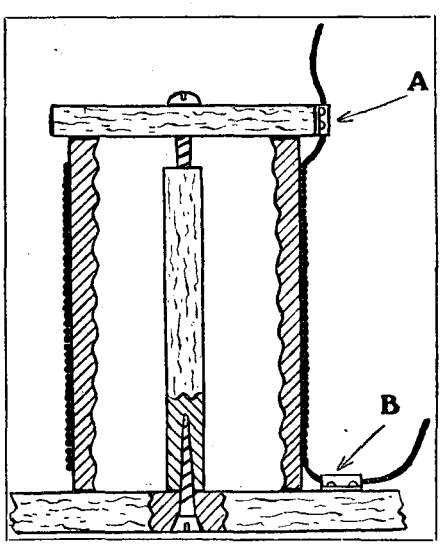
A hole is drilled through each end for the purpose of attaching same to the inside of the cabinet by means of screws or small bolts. Alternatively, the ebonite may be



attached direct to the under side of the panel, or to any convenient part of the inside of the cabinet. The idea will be clearly understood by referring to the lower illustration. Great care should be taken to see that the valve-pins make firm contact with the sockets, and if necessary they should be opened out with the blade of a knife. The position of the valve will, in most cases, be a matter of convenience, but the fact that it should be isolated from other components should not be lost sight of.

## CONCERNING WAX FORMERS.

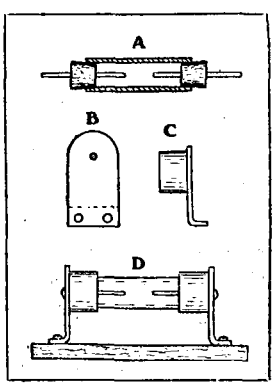
OLD phonograph records make excellent formers for small coils, and it is here shown how they may be wound and mounted in such a way as to obviate the usual trouble caused by the wax being too




brittle. The key to the problem lies in mounting the former first, and afterwards winding on the wire. The accompanying sketch shows a sectional view of the completed coil. A length of wood, slightly shorter than the former, and about $\frac{1}{2}$ in. in square section, is firmly screwed to the baseboard or panel of the receiver, in an upright position, and the wax former is placed over this and clamped firmly in position by means of a piece of wood, which is placed across the top of the former and secured to the top of the wooden pillar by means of a fairly long wood screw. The ends of the winding are anchored by means of small cleats, A and B, which may be cut out from thin sheet fibre or leather, and fitted in the approximate position shown.

## A NEAT POLARITY INDICATOR.

A VERY neat little polarity tester can be made with a short length of glass tubing, two corks, two pieces of wire, two brass brackets, two pieces of brass tubing, and a small wooden baseboard. The glass tube should be about $2\frac{1}{2}$ in. long, by $\frac{5}{16}$ in. or $\frac{3}{4}$ in. in diameter. Small corks are made to fit tightly into the ends, and a short length of tinned copper wire is pushed through the centre of each cork, as shown at A. The tube is filled with water in which is added a small quantity of common salt, and a little sealing-wax or "Chatterton's Compound" is run round the ends of the tube and the corks.




Two pieces of thin sheet-brass are cut out to the shape indicated at B, the two lower holes being provided for wood screws, and the small hole for the wire in the corks. These are then bent to right angles at the dotted line as shown at C, and to each is soldered a $\frac{1}{2}$ in. length of thin brass tubing to fit tightly over the ends of the glass tube. Diagram D shows a side view of the completed instrument mounted on a small wooden baseboard. When assembled, the projecting ends of the wires are cut off flush, and a spot of solder is run into the holes, thus joining the metal "filaments" to the metal supports. When using the instrument it is only necessary to hold the battery leads one on each support. The filament round which the small gas bubbles connect will, of course, indicate the negative side of the battery.

# A NEW MICROPHONE THAT GIVES TRUE PIANO MUSIC.

**Describing the wonderful magneto-microphone which is now in considerable use in the United States.**

TRANSMISSION of true piano quality has been a real problem for the radio engineer. The difficulty is similar to that which has confronted the maker of phonograph records. The blows of the hammer on a piano are distinguishable, but the singing quality and the overtones which are relatively weak have not been reproduced through loud speakers or 'phones.

Engineers connected with the studio of W G Y, the Schenectady broadcasting station of the General Electric Company, have devoted a great deal of time to the solution of the problem, and they have now developed a device which will make the piano solo a real feature of a broadcasting programme.

**Faithful Reproduction.**

The device, in brief, consists of a magnetic system between the poles of which is pivoted a suitable coil system. The magnet is firmly fastened to the frame of the piano and the coil is anchored to the sound board. By means of this pick-up device all tones in the piano are faithfully converted into corresponding electric currents which control the radio transmitter. When heard on the loud speaker, the piano is no longer a tinkling sound. The listener gets all the characteristics of this percussion type of instrument, the blow of the hammer, the singing tone and the overtones.

The piano pick-up is free from the familiar hiss of the carbon microphone, as well as the objectionable blasting that takes place when an artiste plays too loudly for the microphone.

When the carbon or condenser microphone is used to pick up a vocal solo with piano accompaniment the problem is to place the microphone in such a position that it picks up both voice and instrument in their proper ratio. The position of the microphone must be changed for each artiste. The radio listener-in has probably noticed that as the singer increases the volume the accompaniment fades out—in other words, the soloist "paralyses" the microphone. When the piano magneto-microphone is used the intensity of the piano may be adjusted electrically in the control room, even while the selection is being rendered, as the voice is recorded on the customary carbon or condenser microphone.

**A two-valve set constructed, entirely unaided, by Mr. H. Bennett, Fernside Lodge, Hollybush Hill, Snaresbrook, E.11. Mr. Bennett lost an arm during the Great War.**

In the grand piano at W G Y there are three of these devices, one in the extreme treble, one in the middle register, and one in the bass. These three outputs can be readily balanced in the control room for the best results on receiving sets without tampering in any way with the instrument.

**Loud Speaker Work.**

Another feature of the magneto-microphone is that it allows W G Y to correct for the shortcomings of the present loud speakers. All loud speakers subdue the sounds of lower frequencies, from approximately middle C on the piano down. To give good piano music for users of the loud speaker it would be necessary for the transmitting station to distort the music from the instrument, making the lower section of the piano several times as loud as the treble. Some stations have actually tried to regrade their pianos to improve them for broadcasting.

This means that the music, as heard by the musician at the keyboard, is distorted, and the good musician, even though convinced that his radio audience is getting perfect tones, cannot do his best work on a regraded piano.

The magneto-microphone may also be used in broadcasting phonograph music where the federal licence of the station permits the use of "record" music. When the carbon microphone is used the mechanical energy of the phonograph is converted into sound energy in the usual way and is picked up by the microphone. With the magneto-microphone the needle is attached to the coil, and the mechanical energy is converted directly into electrical energy without recourse to any sound whatever, thus giving truer production of the record. By proper design and the use of suitable filters in the electrical circuit of the coil a large amount of the needle-scratch may be eliminated.

# SOME OBVIOUS CONCLUSIONS.

**By 2 G M.**

HAVING devoted a considerable amount of time (and money) to the study of wireless science, I have placed myself in a position that allows me to draw a few logical conclusions concerning the lesser known phenomena connected with wireless telegraphy and telephony. Quite a few experienced amateurs will probably say at once, "In the theory of wireless there may be logic, but in practice, oh, dear, no!" It would seem at first that this is really the case, for the performance of wireless apparatus on test is sometimes peculiar; but I assure my readers that the first five years are the worst. After that they will probably have either descended to stamp collecting or graduated as really genuine "experts."

In the first place, I would warn readers against following up their logical inferences too closely. For instance, it has been noted that nice bright crystals are generally fairly sensitive, that soft and yet cleanly bright crystals are more sensitive, but that invariably quite a hard crystal is required to provide any useful degree of stability. Obvious conclusion: something bright and hard in the crystal line should give good results. The result of this is that an expensive belief has arisen that diamonds are required if efficient rectification is to be attained. A small piece of coal is just as good, and is decidedly cheaper. However, that is by the way.

I have noticed that quite a few valve receivers are endowed with a time factor. It may be the batteries, or it may possibly be the valves, but the fact remains that quite a number of sets that I have handled refuse to function for quite a few seconds subsequently to turning on the filament current. I have therefore come to the conclusion that much feverish knob turning can be avoided if a period of a few seconds is allowed to elapse after the valves are lighted and before commencing to tune in.

**Gaining Experience.**

Whether due to a choking effect or a shock to the circuit's system, I have frequently observed that to clap another amplifying unit on to a receiver that is in action causes a momentary diminution in signal strength before magnification. Obvious conclusion: something is being strained or choked. Anyway, things are not as they should be, and it is better to bring in amplifying stages very gradually by going easy with the filament resistance from point zero.

There are many other things I have noted and which wireless text-books seem to miss, so, finally, the obvious conclusion of the whole matter is this:

Careful observation of the performance of a receiver will put one on the right road to the 100 per cent. mark of efficiency and smooth working. Having accomplished or somewhere approached this desirable state, the life of every component used will be lengthened—*i.e.* economy is effected.

"How obvious!" I can anticipate most readers saying; but it is curious to what extent anything but an obvious conclusion is drawn by the general wireless amateur just graduating from crystals to valves. If a valve filament fuses, perhaps every one of them would jump right away to the conclusion that the H.T. had strayed from its path of orthodox duty, but the expensive calamity *could* be caused by too much L.T., couldn't it? Quite a number of types of valves will burn out on 6 volts. Put another valve in and try less L.T. If the second valve burns out, then it must be the H.T. That is an obvious conclusion, isn't it? That is called buying experience—fifteen shillings per lesson.

# Stand By—

**Concerning Avebury—An Acid Test—Josephine—Special Addresses—The Dutchman—Distant Effects.**

### Concerning Avebury.

WHEN the Marconi Company proposed to erect a high-power station at Avebury, in Wiltshire (where the bacon comes from), a great deal of discussion took place, and there was much opposition to the proposal. However, the Wilts Archaeological Society held a special meeting at Devizes, and examined the plans of the proposed station. When the committee was assured that no attempt would be made to square the Avebury Circle, that the Marconi Company would not devour any pre-historic remains in the vicinity, and that all officials of the company would take off their hats as a mark of respect every time they passed the Circle, the committee withdrew its opposition to the scheme. In fact, the Wiltshire Archaeological Society decided to leave the Marconi Company to its own Devizes.

### An Acid Test.

It has been stated that a broadcasting company is to be formed in Germany with the object of broadcasting music among other things. If this company is established and carries out its programme, it will not be the first German attempt at broadcasting music. You remember their pre-war efforts by means of those travelling broadcasting stations known as German bands.

Did you ever as a small boy try the experiment of devouring a lemon in front of the musician tootling the flute in a German band? A schoolboy friend of mine often tried the experiment. He won an M.C. during the war.

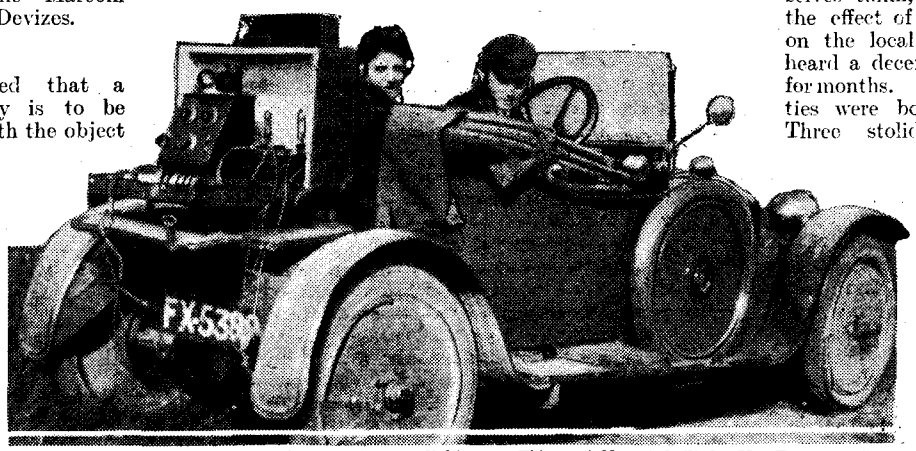
I wonder if one of the 2 L O uncles would like to carry out the experiment in front of the worthy fluterer in the wireless orchestra. It might be interesting to listen-in to the effect. We might hear strange and unusual noises, but until television is an accomplished fact, the best part of the performance, the facial contortions, would be lost to us.

### Josephine.

When a loud speaker was tried on various animals in the New York Zoo, the lion showed his disgust for music by roaring like a silly ass. The bear, however, was delighted, and showed his delight by dancing. Very nice of the bear, indeed. Possibly he danced to show his appreciation of the fact that the tuning coils used were of the honeycomb type.

To some of us it would be nothing new o see a bear da nce to music. Before the war, one of the most picturesque sights in an English village was that of a crowd of villagers looking on at a performance of a dancing bear. The owner of the bear was usually a tall, black-bearded foreigner, and the bear's name was inevitably Josephine. I can remember vaguely the curious refrain which the man chanted as Josephine shuffled round at the end of the rope. It was something like this, Yaddy—addy—addy—yom—yom—yom—yay. I wish I could reproduce the triumphant whoop which immediately preceded the throwing of the staff to Josephine to be caught in her front paws.

The days of dancing bears in our villages appear to have gone for ever. Instead of a live bear at the end of a rope, we have a loud speaker at the end of a live wire. The effect is much the same. We are entertained and the time passes pleasantly.



A neat way of carrying a wireless outfit on a light car. This portable set, built by Mr. E. A. Waddon, 185, Horninglow Street, Burton-on-Trent, fits into the dickey of his car.

### Special Addresses.

I have been rather interested in the subjects of special addresses recently broadcast from our broadcasting stations. The latest list I have compiled includes addresses on motoring, dogs, and—ugh!—great sernakes. Such addresses, of course, appeal specially to special sections of the great community of listeners-in. I am rather inclined to the point of view that a special address on a particular subject should be quickly followed by a second address on a closely allied subject, with so wide an appeal that everybody would listen to it. As an example of what I mean, the special address to motorists on motoring might have been followed by a lecture entitled "Ford stories, old and new." One does not need to be a motorist to enjoy the latest Ford story.

The talk on dogs no doubt interested all those who are at all doggy in their affections, but there are some of us who love not the dog. I should like to have seen the lecture on dogs followed by a lecture entitled, "The Canine Peril, with special reference to the Barkers of the Suburbs," and the lecturer would have been a certain suburban postman of my acquaintance who holds the speed record for retreat from a suburban garden.

The lecture on snakes must have sent a shiver through many a telephone and loud speaker. How nice it would have been if such shivers had been dispelled by a little homily on the fascination of snakes—and ladders.

If I may be allowed to throw out a suggestion or two with regard to these special addresses, I would like to hear Uncle Arthur give us a lecture on the art and practice of microphonic elocution. I would also suggest that the inimitable Two Emma Toc humour us with a special address on choke control for the benefit of those who are inclined to cough in church during the sermon.

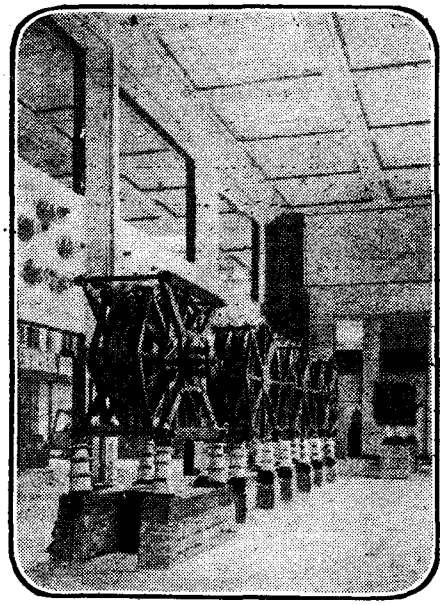
### The Dutchman.

Our old friend, P C G G, has fallen on evil days, temporarily we hope. It appears that the Dutchman's neighbours have complained about the noise of his generators. The neighbours put it to the authorities that when P C G G was transmitting they could not hear themselves think, and that, owing to the effect of P C G G's generators on the local cats, they had not heard a decent bit of caterwauling for months. Of course, the authorities were bound to take action. Three stolid officials and one small boy, wearing the trousers of the period with the usual coloured after effects, marched up to the transmitting station, and with much ceremony sealed up the generators. Poor old P C G G! The sealing on his generators will prevent his waves from bumping up on the Heaviside ceiling for a week or two.

### Distant Effects.

Personally, I am not very interested in the new German wireless wave which is supposed to stop a motor-car from a distance. You see, I only ride in a Ford which saw service in France, and I am perfectly certain no German wave would stop my Tin Lizzie. Why, a whole flock of sheep couldn't stop Elizabeth. She just jumped over them, and, as for level-crossings, she just revels in making the crossing-gates level.

Somebody might do something useful in this direction, though. Why not a vest-pocket transmitter which would silence a ten cat-power singer from any distance up to twelve feet? Why not a bulkier piece of apparatus which would silence a street piano or a gramophone within half a mile? Such apparatus would be of far more benefit to suffering humanity than apparatus designed to stop the grocer's motor-delivery van or the baker's bread-wagon.



The variometer tuning coils at Nauen.

# NAUE

**By OUR EUROPEAN CORRESPONDENT.**

**Some interesting details about one of the largest and most noted wireless stations in the world. The time signals from this station are scarcely less famous than those of Eiffel Tower. Nauen, whose call is P O Z, was used extensively by the Germans for propaganda work during the Great War, but since then it has been considerably developed for commercial purposes.**

"NO more striking instance of the unceasing variability of things could be imagined than the continual changes in the lay out of Nauen," Mr. Nairz, the obliging chief engineer of the Telefunken people, remarked as we were leisurely driving from the railway station to that world-renowned high-power wireless station, "for never since my first connection with it have I, even for a moment, known it to come to a standstill. Never would you have been able to tell just when its installations happened to be complete, and even now, though my last visit was only three weeks ago, I am unable to say what stage in its incessant development has actually been reached, and before introducing you to the station, I shall myself require some information and guidance."

### Recent Developments.

THIS simple statement admirably agreed with my own experience, for since, a couple of years ago, I had myself last seen the high-power radio station of Nauen, one of the largest and most powerful in the world, a wonderful change had taken place. In fact, its machinery was then housed in a modest building, and musical spark transmitters were mainly used to send out into space the electrical energy bridging the ocean. Though the time has long passed when a tremendous noise from afar announced the proximity of the wireless station, and its acoustic range, as a bad joke would have it, was larger than its electric range, the generators of wave energy were even then rather boisterous in operation.

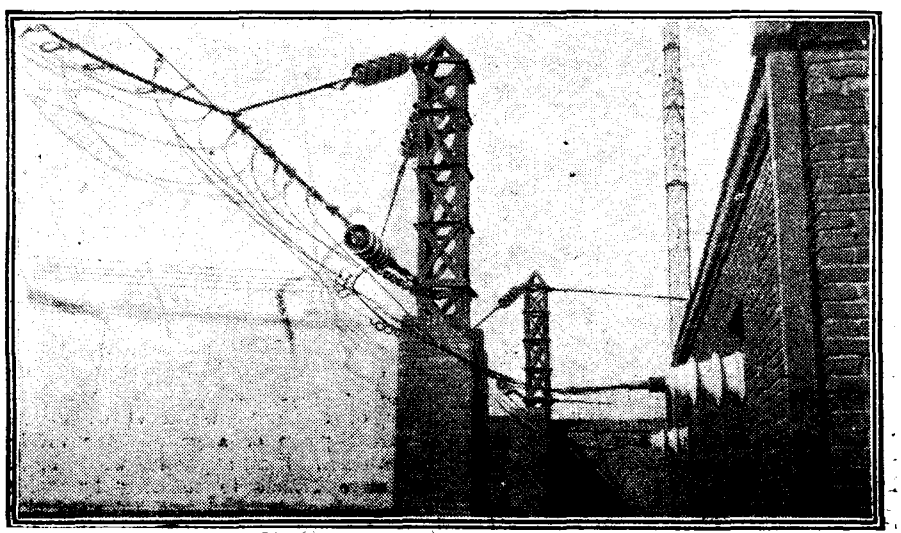
How very different the huge radio station was looking now. Though the old engine-house still existed, it had been relegated to a quite secondary rôle, and the musical spark generators, once looked upon as marvels of perfection, were kept idle most of the time, only entering into action twice a day for a minute or so to send out the well-known Nauen time signals used by seafaring people, watchmakers, and scientific institutes to check their time-pieces. The visitor was now received in a magnificent building, designed by one of the masters of engineering architecture, which in its splendid halls accommodated a most up-to-date electric power plant as nearly noiseless in operation as possible. Also, the antenna system had been further developed, the number of slender iron-frame-work antenna towers of nearly Eiffel Tower dimensions having strangely multiplied.

### Distant Control.

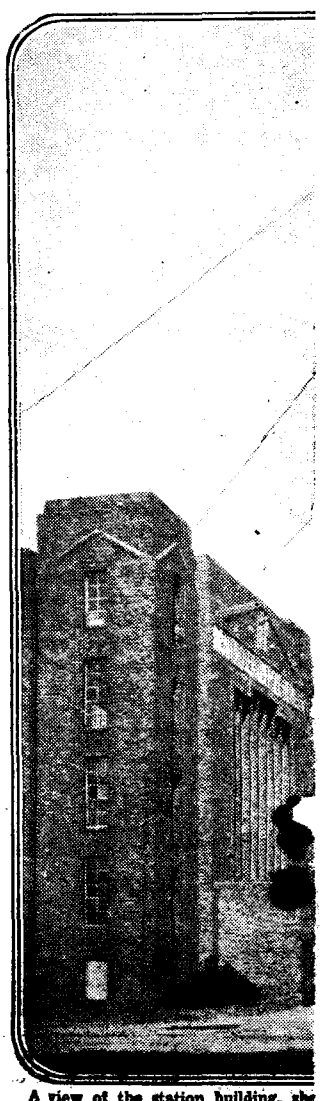
MOREOVER, while a few years ago Nauen was not only a place where electric waves were generated and emitted into space, but, at the same time, a busy telegraph station, it now merely fulfilled the duty of a big station transforming energy for its own consumption, the emission of waves being controlled from the Berlin telegraph office, where the telegraphists, operating the Morse key (of the high-speed telegraph transmitter) through a line of connection with Nauen, directly act upon the wave transmitters, while at the same table there are seated the operators receiving radio messages from the other end through a wire communicating with the radio receiving station at Geltow near Potsdam. No telegraphists, and practically no engineers are now to be seen at Nauen, only machines are at work, and human interference is practically confined to an occasional superintendence and "dusting" of the brand new machinery. The electrical energy for operating the high-frequency generators is supplied from the Spandau generating station situated at about 25 kilometres distance, the 15,000-volt 50-cycle 3-phase current being taken by a double overhead line to a switch-gear cabin in the immediate vicinity of the station building, and thence by two underground cables to a converter plant, one line of conductors thus being always available in case of breakdown of the other. The maximum output thus transmitted is 1,000 kilowatts.

For the operation of the two high-frequency generator sets which are now mainly relied upon to yield the necessary wave energy, the 15,000-volt 3-phase current is stepped down to 1,000 volts, supplied to each of the high-frequency motors, direct coupled to high-frequency generators. The motor output in the case of the 400-kilowatt set is 750 h.p., with 1,500 r.p.m., while that of the 130-kilowatt set is 375 h.p. Comprehensive water and air cooling has been provided for both sets.

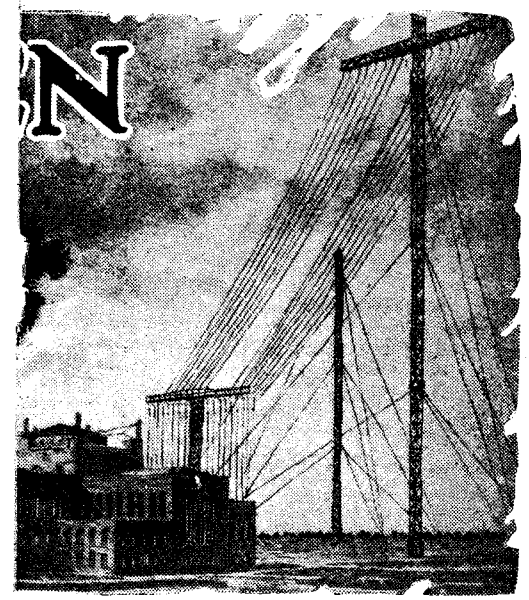
The very imposing engine hall looks, to all intents and purposes, like that of a large up-to-date generating station. Push buttons for starting the machinery, as well as all accessory instruments and levers, are arranged on the pedestal of the switchboard. Behind this are seen the



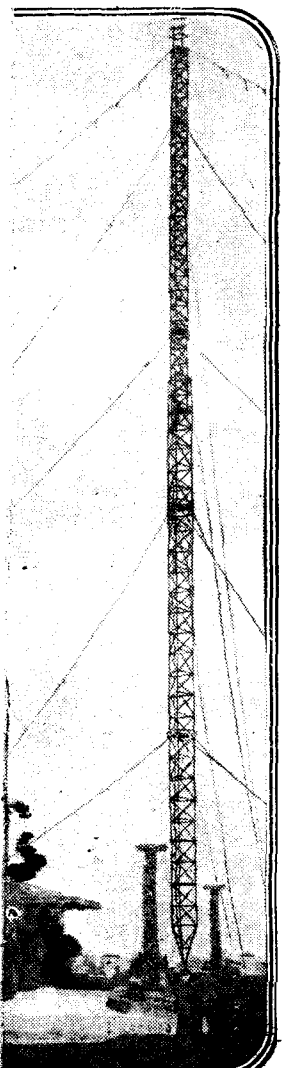
The lead-in system from one of the aerials.



A view of the station building, she masts. This mast is



two 400-kilowatt generator sets, one of which serves as a stand-by, and the generator set of 130 kilowatts plant installed in the middle. A high-frequency switch-board enables, by means of push buttons and switches, any variometers, wave switches, and keyboard relays to be operated from a pedestal in the centre of the hall. The frequency transformers and condensers for the 400-kilowatt sets are found on the right, and those for the 130-kilowatt plant on the left. By operating a button on the switchboard a grip is actuated mechanically, the proper position of which corresponds to the maximum deflection of the antenna ammeter.



wing part of one of the main 250 metres high.

The most remarkable change being made in the installations of Nauen station, and which by the time this article is printed will be practically completed, is an enormous extension and improvement of the antenna system, calculated to make Nauen even more powerful than heretofore, and to enable the distance between it and Buenos Aires to be readily bridged even under unfavourable atmospheric conditions. All the roof cables formerly used having been removed, the new system is composed entirely of triangular antennas, each kept (and insulated) only at the three angles, which arrangement enables the antenna tension to be increased more readily.

In fact, inasmuch as the antennæ and especially the antenna masts are the most expensive item in the construction of a high power wireless station, corresponding to about 75 per cent. of the total outlay, endeavours should be made to reduce their number as far as possible. It may be said that an antenna system, comprising 8 masts and insulators designed to stand a maximum tension of, say, 160,000 volts is equivalent to an antenna system comprising 14 masts and insulators standing 80,000 volts, i.e., suffices to insure the same number of metre-amperes, while only costing slightly more than half. Moreover, the number of antenna masts can be further reduced by placing them as wide apart as possible, and by suspending extensive wire systems between them. Corona losses, otherwise inseparable from the use of extremely high tensions, are avoided by using aluminium cables as antenna wires, which with equaweight have a cross-section three times as large as—i.e. of greater strength and accordingly smaller sag than, bronze cables.

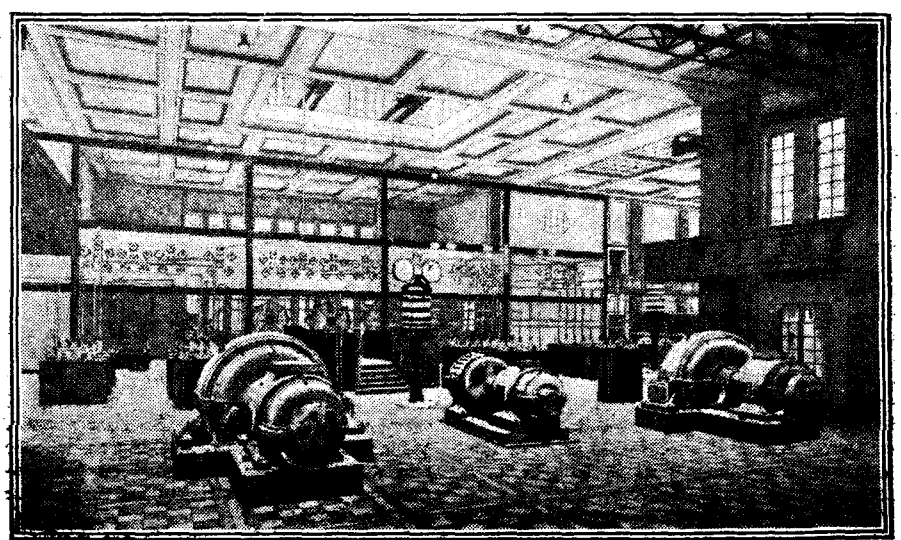
The new antenna system comprises six antenna masts each 110 metres high, and two antenna masts of about 180 metres in octagonal arrangement round the station building, as well as two masts of 250 metre and two of 180 metres and 210 metres respectively, in the interior of this octagon. The whole system is made up of two sets of three triangular antennæ constituting between them what is known as A-antenna, and communicating with the station building. Between these there are installed two other sets, each consisting of one triangular antenna, and which are known as B and C antennæ respectively. The earth (ground) comprises a system of wires and plates stretched out above and partly dug into the soil.

### High-Power Generators.

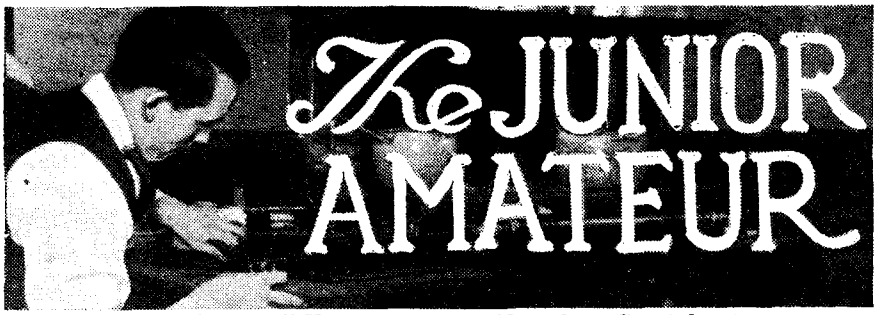
THE K.W. high-frequency set comprises a generator placed on the same foundation plate as the motor to which it is directly coupled, and supplies a pressure of about 500 volts with 500 K.W., and a fundamental frequency of 6,000 cycles. This current is at first supplied to a tension transformer raising its tension to 2,500 volts, and thence to the first high-frequency transformer, doubling its fundamental frequency. Another frequency transformer raises the number of cycles from

A section of the engine hall.

12,000 to 21,000, and a third one to 48,000 cycles. The 24,000 frequency, of course, corresponds to a wave-length of 12,600 metres, the 48,000 frequency to a wave-length of 6,300 metres. The antenna and earth are connected to the secondary coil of the second and third frequency transformers, the antenna current being 360 and 250 amperes respectively, and the antenna tension 100,000 and 35,000 volts respectively. The waves radiated, of course, are of the continuous wave type, the antenna giving out a uniform rapidly alternating current rather than intermittent trains of waves as corresponding to each spark in a musical spark station. The generator of the 130 K.W. plant supplies a fundamental frequency of 8,000 cycles with an output of 200 K.W. After first raising the tension, the electrical energy is also in this case supplied to frequency transformers yielding in the first stage 16,000 cycles, in the second stage 32,000 cycles, corresponding to a wave-length of 9,400 metres, and in the third-stage 64,000 cycles, corresponding to a wave-length of 4,700 metres, the current intensities in the antenna being 160 and 135 amperes respectively.



The caaacions engine hall, showing the generators.




**A "Flash-lamp" H.T. Battery—A Chat about Crystals, etc.**

## A "FLASH-LAMP" H.T. BATTERY.

A HIGH-TENSION battery may be very cheaply and efficiently constructed from ordinary flash-lamp batteries in the following manner:

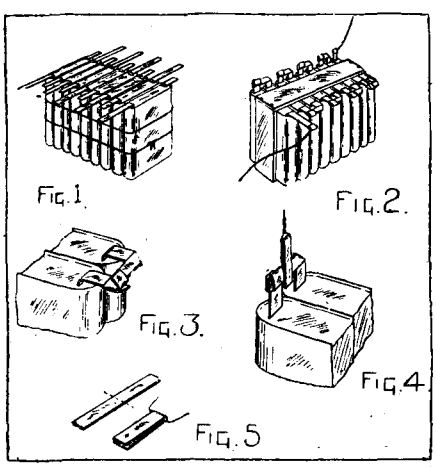
The average voltage of each battery is reckoned as four volts and the requisite number chosen to give the required maximum H.T. voltage. Thus if 36 volts maximum are required, nine flash-lamp batteries would be required. These are placed side by side, and either held together by a binding of string (Fig. 1) or by nailing or screwing together four strips of wood of suitable lengths (Fig. 2). Care must be taken that the batteries are so arranged that the short brass strip on one battery is next to the long brass strip on the next battery, and all the strips are then bent outwardly as shown in Fig. 1.

The brass terminal strips are first of all bent outwardly (Fig. 3) and cleaned with emery or sand paper, and then each of the long brass strips is bent with a pair of pliers at an angle of 45 degrees (Fig. 3), so as to lie across one of the adjacent short brass strips with the end projecting just beyond the short brass strip. This end is then bent under and squeezed tightly against the underside of the short brass strip (Fig. 3), so as to make electrical contact therewith. Preferably the long brass strip is so bent across the short strip that a piece of the short strip is left projecting, and this is bent over against the upper surface of the long strip (Fig. 3). By this means efficient electrical connection is established between adjacent batteries throughout the set, each battery being electrically connected in the manner described above to the two batteries on either side thereof.

**A Neat Battery.**

When all the batteries have been connected up, the connected brass strips are bent upwards as shown in Fig. 2, and the connecting wires to the valves may be soldered to, or twisted round, the brass strips at any desired point of the battery. It is often convenient, however, to be able to adjust the high-tension voltage on the valve or valves, and to facilitate this short strips of brass may be folded over (Fig. 4) and soldered or wired to the connecting wires. These bent strips may then be easily slipped on to any one of the horizontal parts of the long brass connecting strips to give any required high-tension voltage.

The above-described arrangement has the advantage of not necessitating any soldering, and of enabling any defective or used-up flash-lamp battery to be readily removed and replaced when desired. At the same time, however, better connection is obtained than if the terminal strips of the batteries were merely wired together, such wiring generally becoming loose in a very short time.




## A CHAT ABOUT CRYSTALS.

AMATEURS who are not lucky enough to own a valve set do not always realise what a very interesting field for experiment and investigation lies within their reach along the more humble levels of crystal reception.

In fact, in certain circles of radio club-land the idea seems to prevail that no real amateur would be bothered with anything so uninteresting. Nothing could be further from the truth, and the possessor of a crystal set should not be discouraged by this kind of talk, for he can get more experimental interest from crystals than many a multi-valve fiend gets from his hyper-sensitive super-boosted signals.

All this worship of deafening din and this cult of the loud speaker is only one aspect of wireless. View it from another standpoint and there is just as much fascination and excitement to be found, with the advantage of only a trifling outlay. After all, strong signals are not the only kind—why not go in for *weak* signals? With a crystal set you can specialise in the finer sounds. Why not investigate something as delicate and dainty as can be placed on the diaphragm, instead of striving for mere noise and reverberation?

No additional instruments are required, or if they are not already in your possession they can easily be made. All that is necessary is a good arrangement for loose coupling, several detectors, and as many varieties of cat's-whiskers and crystals as you can accumulate.

With these you can test the efficiency of your circuits, improve your aerial and earth, trace out the astonishing effect that a bad contact has, and lay bare all sorts of fascinating wireless secrets. You can turn your back on the crowd who clamour for loud signals, and reach out for yourself into the delicate operating that is required for sounds that are almost inaudible.

Moreover, if the idea appeals, you can start to carry it out at once. First of all tune in to the most convenient loud signals. Get your crystal really sensitive, your 'phones on tight, and then commence the fun by loosening the coupling until the signals are dead weak. When they can only just be heard, leave the coupling alone for a moment and strengthen them again by retuning both circuits.

You will find adjustment is needed to compensate for the coil having been moved away from the aerial circuit. Thus you will begin to notice and understand the effect of mutual induction between two circuits, for after you have carefully re-tuned the set your signals will be noticeably stronger again. So you proceed to loosen the coupling and bring them down once more to the point where they can only just be heard.

**Increasing Efficiency.**

This loosening of the coupling between the circuits is the key of the whole matter, and it is simply wonderful how far it can be carried. It begins to get really exciting when the aerial coil is perhaps eight or ten inches away from the secondary coil and signals are still coming through. This is wireless within wireless! Your aerial is transferring the received energy across quite a big space, and the beauty of it is that there seems no limit to the process.

Every improvement you can make will bring those signals up again and enable you to move that coil out. It becomes an obsession and you scrutinise the whole set with a new and critical interest. You fix a pointer or a pin in the coil and mount a rule or scale underneath it, so that you can compare the results. Perhaps when you think you have attained perfection you find you are only just beginning the real fun.

The substitution of a smaller condenser across the 'phones may give you a quarter of an inch along the scale, and one glorious day you discover that by merely pressing tight the sliding contact upon the coil you can get just about an additional inch of coupling. One inch! Automatically you become an expert in good earthing, etc. The directional effect of an aerial is as plain to you as though it were labelled like a 'bus. But insulation becomes a personal affront, and you will never forget how after one wet night, in order to make your familiar friend at all readable, you had to come down from eleven inches of coupling which you had attained in dry weather to just under seven inches. Never again will you be caught napping with poor aerial insulation!

Perhaps enough has now been said to indicate how very illuminating a crystal set can become when tackled along these lines, and you will find that a flood of light can be thrown upon the efficiency of your set by critical investigation.

# SALE!!!

**BRITISH SULLIVAN PHONES**
2,000 ohms .. **16/6**
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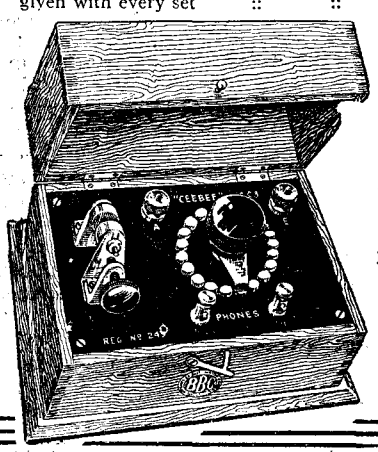


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# TECHNICAL TALKS TO "LISTENERS."

**By Capt. C. C. J. FROST (of the British Broadcasting Co., Ltd.)**

**In this second article the author gives the reader a clear idea of what the ether disturbances called wireless waves are, and of what is meant by "wave-length."**

THERE are so many different queries which "listeners" ask that I am rather at a loss to know exactly where and what to deal with first of all. I have received such a multitude of letters asking why *this* happens and how *that* happens that I feel that I can well assume that the things which puzzle my listener friends who write to the B.B.C. asking for advice may also rather confuse others whom I hope to reach through the pages of POPULAR WIRELESS.

If any of my readers feel that I am dealing with very elementary points, then please bear with me, as I am endeavouring to aid the one to whom wireless is rather a myth and wholly something which takes a very great deal of understanding. Let me, please, do my best to prepare the foundations in as interesting a way as possible, and on those foundations to lay the first few bricks whereon the whole construction of the house may be built, with its many various ornamentations and etceteras.

### Simple Analogy.

I propose, then, to talk for a little while about aerials, and then for a time about earths. So very many people ask my advice on the type of aerial and the best earth. First of all, let me endeavour to show you the relationship between the aerial at the broadcasting station and the aerial which you are using. Let us imagine that we are in a punt or rowing-boat anchored at the centre of a large circular lake, the surface of which is absolutely calm and undisturbed by ripples. The shore of the lake is in sight and close to the shore in one direction a small boy is sailing a toy boat, on the tiny mast of which flies a flag. On the farther shore of the lake another little lad has thrown a cork into the water, which is floating close to the shore. Both the boat and the cork are floating on the water without any movement from wind or wave.

Suppose that I suggest to you that you might add to the amusement of the two boys by so disturbing the water that the wave you cause may cause the boat and cork to bob up and down on its breast, and really make the youngsters think their toys are gallant ships sailing a stormy sea. You could hit the calm water with a cane just once, and the ripple or wave would travel out and out from the boat until it reached the shore, causing the boat and cork to bob up and down. In other words, you have with your cane caused a displacement of water at one point on the quiet surface, which has been passed on and on in the form of a wave until the more solid shore is reached.

In just such a way the ether is disturbed during transmission from your broadcasting station, and the aerial of the station is, in part, instrumental in that disturbance. The ether wave, then, as it leaves the aerial of the broadcasting station is similar to the water wave as it leaves the place where your cane displaced the water on the lake's calm surface and caused a ripple. Imagine now that the stretch of water between our punt and the toy boat is the stretch of intervening ether between the transmitting aerial of the broadcasting station and the receiving aerial in your garden or house. The ether wave at the speed of light (186,000 miles per second) travels across this intervening space, and, in passing, strikes your aerial.

Perhaps "strikes" is rather the wrong word to use in this case—it really "charges"

Fixing up a "double" aerial.

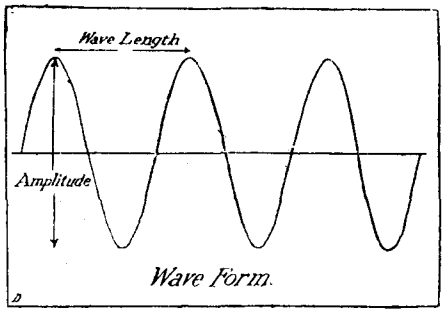
your aerial and the earth beneath the aerial with electricity, in just such a way as the water wave on the surface of our lake reached the toy boat and caused it to bob up and down, and the tiny flag to wave to and fro with the motion of the boat. The more force which you use in striking the water with the cane, the greater the force behind the ripple or wave and the more violent will be the motion of the toy boat. The *height* of the wave will be greater from the trough to the crest, but the distance from the crest of one wave to the crest of the next will be the same as when you use less force in striking the water.

### Explanation of Wave-Length.

The force used behind the cane may be compared to the transmitting power used in radiation from the broadcasting station's aerial.

Thus we may easily see that there is a distinct connection between the height of the wave and the force used behind the cane. In other words, the amplitude or height of the ether wave depends on the power used in transmission.

Suppose that whilst in the punt I handed you a ruler and asked you to measure, were it possible to do so, the distance from the crest of one wave to the crest of the next. You would then be able to say that the length of wave or wave-length is so much. Wave-length, then, is the length of the ether wave measured from the crest of one wave to the crest of the next, and is expressed in metres. My readers will see, I




think, that wave-length has nothing to do with the distance which a wave travels between the transmitting and receiving aerials. I emphasise this point because a "listener" the other day asked me how it was that the London station, which uses a wave-length of 369 metres, could possibly be heard by him situated 10 miles away, when 369 metres is really only about one-fifth of a mile!

I fear that I have touched but the outer fringe of the talk which I wish to have on the question of aerials, and next week I hope to further talk about them, for I feel that so very much must be explained, so that any of my readers who are in doubt as to the exact functioning of their aerial may be able to think out for themselves the best forms and types of aerial to use towards more efficient reception of broadcasting, or, in fact, any signals which they may be able to receive.

## CUTTING OUT THE LOCAL BROADCASTING STATION.

INABILITY to tune out near-by stations cannot usually be overcome by the addition of another stage of high-frequency amplification, and even the use of a loose-coupled tuning unit will not eliminate the local station, since it is found that the secondary coil acts as a frame aerial at this short range.

The sure way to cut out any one station is to add to the valve set a crystal set. This simple crystal receiver is connected to the aerial and earth as well as the valve set. The crystal set is tuned to the wave-length of the unwanted signals, when it will be found that any other station can be selected and tuned-in without the least trace of the undesirable station.

If a complete crystal set is not available, a tapped coil with a variable condenser in parallel can be placed across the aerial and earth, and the local station tuned out by trial in conjunction with the valve set.

# WIRELESS IN SCHOOLS.

**By S. V. HEAP, A.C.P. (Headmaster of Sittingbourne Council School).**

**A SERIES OF PRACTICAL NOTES FOR THE GUIDANCE OF TEACHERS AND PUPILS.**

## III. THE CRYSTAL DETECTOR—CONDENSERS.

THE variable condenser, as its name implies, is a piece of apparatus the capacity of which can be varied by the degree of overlap given to alternate sets of vanes or plates, one set being fixed and the other moving, and each set being electrically insulated from the other.

Its function is to vary the capacity of the aerial system, and being variable, it enables fine tuning to be accomplished.

Much ingenuity has been brought to bear on the design of variable condensers, and by mass production of component parts, standardised spindles, vanes, washers, and nuts have been brought to such a low price that it is not worth while to make the various parts in the workshop or classroom, but rather to devote attention to the correct assembly of the several components.

It is assumed, of course, that the type of condenser with rotary vanes will be selected as giving most satisfaction in general use.

For the school set, a condenser of ·0003 mfd. capacity, having 10 fixed and 9 moving vanes, will be found quite satisfactory.

These may be experimentally interchanged with advantage, and the relative ease and efficiency of tuning duly noted.

A most satisfactory type of cabinet for the rotary vane condenser was described by the writer on page 706, No. 31, of this publication.

Having glass sides, this cabinet is particularly useful for school use, as not only does it effectively protect the condenser from dust, but at the same time it enables every part to be seen from all sides.

### Construction of Detectors.

The crystal detector next claims attention. The simpler the construction of this piece of apparatus the better, provided that it admits of quick and ready adjustment. Excellent types of detectors are described in Nos. 22, 36, and 50 of POPULAR WIRELESS. Any of these may be readily constructed from the directions given. All things considered, the "Perikon" or two-crystal type of detector is perhaps more satisfactory than the sensitive but erratic cat's-whisker-cum-galena, or patent crystal variety. It has the advantage of greater stability, and if the crystals are selected with care and carefully treated it yields little in the matter of sensitiveness, and will render good service.

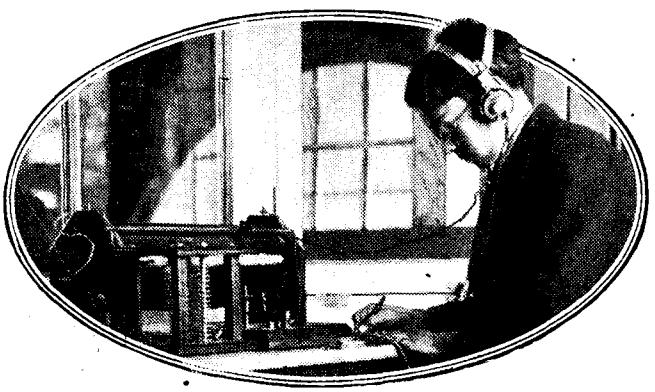
Zincite with copper pyrites, and zincite with bornite are the combinations which the writer has found most efficient.

A useful detector consists of the springy brass strip from a pocket flash-lamp battery, bored at one end to hold the upper crystal cup and held in the slit of a valve leg which is supported horizontally by a large telephone terminal, through the hole of which it passes, and is clamped in position by the milled screw of the terminal Fig. 6. The lower cup is held by a similar piece of springy brass in which a keyhole-shaped slot has been cut to facilitate removal and replacement. Connections are made to small terminals, as shown in the diagram. Both crystal cups can be exchanged in less than a minute. The pressure can be varied by turning the valve leg, to which a suitable knob can be attached.

The detector may be built in the baseboard of the set, in which case the terminals should be ebonite-bushed, as previously explained.

It is, however, a great convenience sometimes to have the detector self-contained on its own base of ebonite or mahogany.

The arrangement above outlined gives universal movement in the horizontal plane to both upper and lower crystals, and should it be desired to employ galena, or any synthetic crystal requiring a fine wire contact, the cat's-whisker can readily take the place of the upper crystal cup.



**Listening-in on one of the sets belonging to a London School.**

Wood's metal is usually recommended for fixing the crystal in the cups, but when heated too strongly this alloy can impair the rectifying properties of the crystal. A good substitute is the amalgam used by dentists for stopping molars. For a few pence any friendly dentist, or dental chemist will supply a small quantity of the metallic filings which, when triturated in the mortar with a few globules of mercury and then kneaded in the palm of the hand, will make a hard-setting paste with excellent conductivity.

### Demonstrations.

*Magnetic field* should be demonstrated by means of magnets, iron filings, and a sheet of glass or stiff paper.

*Electric field:* Similarly by means of electrified bodies, pith balls, feathers, and other light objects. If an electroscope is available so much the better.

*Induction*, both magnetic and electric, should be demonstrated by simple experiments with magnets and thin strips of sheet iron or soft iron nails, also with a proof-plane (a halfpenny fixed on a stick of sealing-wax) and electrified conductors.

*Capacity effects:* Charge an electroscope—observe the divergence of the leaves. Hold the hand just above the cap and observe how the divergence is decreased. Remove the hand and show that the divergence increases to its original value. Charge an insulated sphere (knob from bedstead). Hold a metal plate in the hand near to the sphere. Test the charge on the near side of the sphere with proof-plane and electroscope. Observe the divergence and then discharge the electroscope. Test the remote side of the sphere in the same way and observe that the density is much less.

### Simple Leyden Jar.

*Condenser:* This tendency of an electric charge to accumulate owing to the proximity of an earth-connected conductor is termed condensing, and any arrangement by which the capacity of a conductor is increased artificially constitutes a condenser.

The Leyden jar is a simple form of condenser which is easy to make. Take an ordinary eight-ounce or ten-ounce glass bottle (reagent bottle) from the laboratory, and rinse it out with gum arabic solution. Whilst the inside is still moist introduce a quantity of brass filings, and shake them up. Sufficient will adhere to the inside of the bottle to furnish a good metallic lining. Cover the cylindrical part of the outside of the bottle and the bottom with tinfoil, using gum arabic to fix it. Then fit a cork in the neck, bored to receive a brass rod terminating in a ball (an aluminium knitting-pin will do). The rod should make contact with the bottom of the bottle. The uncovered parts of the bottle and cork should now receive a coat of shellac varnish. The appearance is greatly improved by using red sealing wax dissolved in methylated spirit.

When all is set hard and dry the jar may be charged by means of a glass rod or tube rubbed with silk, an ebonite rod rubbed

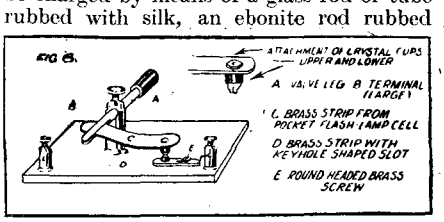


FIG 6.
ATTACHMENT OF CRYSTAL CUPS — UPPER AND LOWER
A VALVE LEG B TERMINAL (LARGE)
C BRASS STRIP FROM POCKET FLASH LAMP CELL
D BRASS STRIP WITH KEYHOLE SHAPED SLOT
E ROUND HEADED BRASS SCREW

with flannel, or even with a piece of warm dry brown paper briskly rubbed with a dry clothes brush.

Drawings of experiments and apparatus should be made as before. Composition exercises in the shape of essays and of written answers and descriptions should be continued. The derivations and meanings of newly introduced technical terms should be added to the notebook, and the record of activities entered in the Wireless Log.

*(To be continued.)*

# FILES AND FILING.

**By "RADIOGRAPH."**

**Some practical hints concerning a very important branch of constructional work, and one that no amateur desirous of obtaining first-class "finish" can afford to neglect.**

WE often read such phrases as "file down to a good fit" in text books and periodicals dealing with practical work, and if it were as easy to carry out these instructions as it is to write them we should all be first-class mechanics. Unfortunately, however, the art of filing cannot be taught except by experience; but some hints on the subject by one who has pushed various forms of files over jobs, with an aggregate total of some miles (taking all the strokes into account), may be of help to those whose work is sometimes marred by indifferent performances with this useful form of tool.

The first thing about filing is to adopt an accurate stance in relation to the work to be filed. The movement of the file is not merely regulated by those of the arm, but derives its accurate alignment from the poise and balance of the whole body. This applies equally whether one is dealing with large or small jobs, and one can test the statement by trying to do a tricky filing operation when standing on one leg. The vice in which the work is fixed should be at elbow height or thereabouts, rather lower for heavy work, and a little higher when fine, delicate work is in progress.

### The Correct Stance.

To stand in the correct position for accurate filing, the feet should be spaced a short pace apart, the toe of the left foot being at right angles with the bench, with the right foot at right angles to the left. Although it may sound rather far fetched to place such importance upon the position to adopt for filing, care in this direction is really necessary, for the file will automatically follow the line of the left foot, and it is impossible to get a flat surface upon filed work unless the weight of the body is evenly supported on both feet.

With the body poised in the correct position, we may now turn our attention to the hands and arms; here we have to remember the necessity for balancing the file on the work just as much as we do in balaneing the weight of the body on the feet.

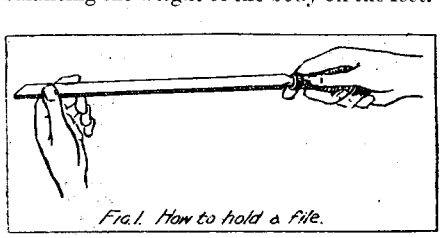


Fig. 1. How to hold a File.

Work can never be filed properly if one leans heavily upon the job, or if the strokes are made with jerky, staccato movements. The handle of the file must be held firmly, yet lightly, between the thumb and first finger of the right hand, merely using part of the palm as a means of propelling the file on its forward or cutting stroke. The forward end of the file should be rested upon the pads of the first two fingers of the left hand, and gripped lightly between them and the thumb.

The great art in filing is to acquire the easy movement of the arms in unison with a slight swing of the body, so that the file follows a perfectly even movement in a level plane. This can only be acquired by assiduous practice; but it will help very much if one remembers that there are two distinct strokes in filing—*i.e.*, the forward or *cutting stroke*, and the backward or *clearing stroke*. Naturally the power and pressure necessary to remove the metal with the teeth of the file must be applied during the whole period of the cutting stroke, and any failure to keep the pressure continuous with the length of the stroke will mean that the work will develop a hump in the middle, instead of being flat.

People who are learning to file adopt a stroke following a semicircular sweep

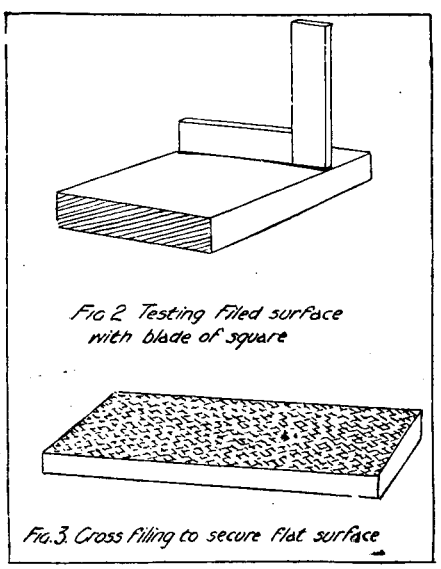


Fig. 2. Testing filed surface with blade of square

Fig. 3. Cross filing to secure flat surface

instead of following a truly horizontal course. Incidentally, it may be mentioned that the former is cultivated when one wishes to file convex surfaces, and should, therefore, be avoided when treating flat work.

### Use of Try-Square.

In view of the difficulty in producing perfectly level surfaces by means of filing, the amateur needs to take particular care in testing the work whilst the process is going on. Fig. 2 shows the section of a piece of flat material, which it is desired to reduce in thickness by means of filing. As the surface is rather large, there is more than a possibility of making it convex instead of flat by the action of the file, and consequently the surface should be tested continually by means of the edge of the blade of a try-square, as shown in the illustration.

Here it will be seen that light passes between the square and the surface at two points, revealing the lump in the middle. If the lump is not so exaggerated as in this case, and very little light passes under the blade, the accuracy of the surface can be tested by rocking the square across the surface.

LEVELLING SURFACES BY CROSS FILING.—Assuming that one is working on a piece of flat brass of the shape shown in Fig. 3, and, besides squaring up the edges, the surface has to be made quite flat, we come to an important point, for instead of making the file strokes across the piece of metal or

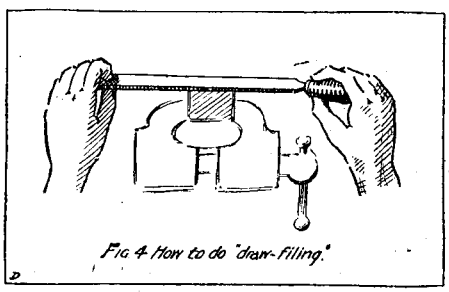


Fig. 4. How to do "draw-filing."

lengthwise of it, they should follow a diagonal course. After making a number of strokes from the left-hand corner of the work towards the right, the direction should be reversed, so that the strokes then follow from right to left. This is known as cross-filing, and by maintaining the regularity of the crossing as shown by the file marks (see Fig. 3), it is much easier to file things level than would otherwise be the case.

### A Searching Test.

AMOUNT OF MATERIAL REMOVED BY FILING.—Amateurs who wish to turn out really first-class work should devote a few evenings to nothing else but filing experiments. Not that they are likely to attain proficiency in so short a space of time, but at any rate the experience will enable them to find out little points of practical use when they come to use the file in connection with constructional work.

One might do worse than spend an evening or two in trying the well-known dockyard test for fitters. One is given a piece of round, mild steel, about $1\frac{1}{2}$ in. diameter, and a piece of $\frac{1}{8}$ in. plate 3 in. square. The test consists of filing the round material into hexagon shape, and then fitting it accurately, side by side, into an internal hexagon made in the piece of plate. When one can do this properly, he may consider himself a passable artist with the file.

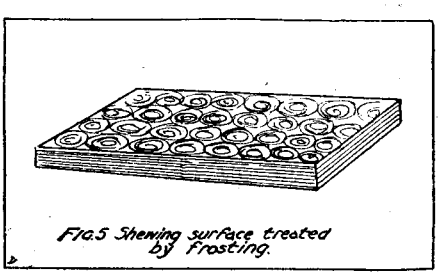


Fig. 5. Shewing surface treated by Frosting.

(*Continued on page* 262.)

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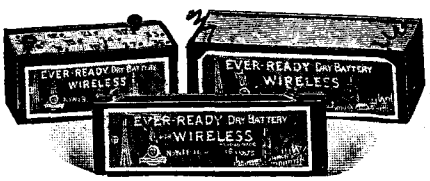


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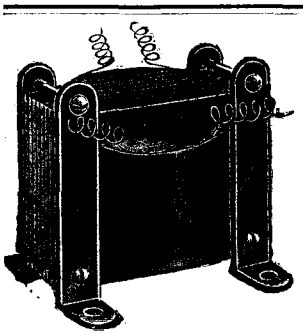

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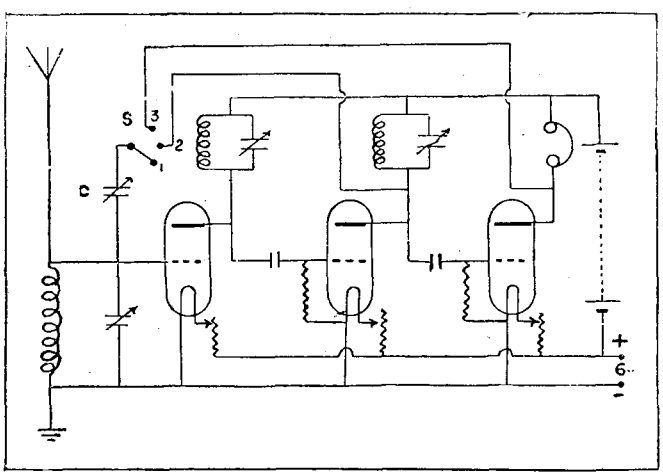
# THE USE OF CAPACITY AND RESISTANCE REACTION.

**This is a subject that should receive careful attention from all possessors of valve receiving apparatus.**

PROBABLY due to the fact that it is not very well known among amateurs, capacity reaction is very seldom used by them. One ought to say, very seldom used *intentionally*, since howling and self-oscillation are frequently attributable to small accidental capacities, such as those of the valves and the wiring.

Capacity reaction deserves more attention as it can easily and economically be fitted to almost any set, being especially useful in sets employing radio-frequency amplifying valves. In an amplifier of this type, the radio-frequency potentials of the anodes of adjacent valves are, to all intents and purposes, 180 degrees out of phase with each other. That is to say, when the anodes of the first and third valves are at their maximum positive (oscillation) potential, those of the second and the fourth are at their maximum negative potential. These oscillation potentials are being considered apart from the steady positive potential applied by the H.T. battery. The diagram demonstrates how this phenomenon can be made use of. It shows a three-valve set with two R.F. (radio-frequency) valves and a detector. The only additional apparatus is the three-way switch S, and the variable condenser C, the capacity of which should be between .00005 mfd. and .0001 mfd. When the switch arm is on number one stud no reaction is in circuit. Position number 2 connects the condenser between the grid of $V_1$ and the anode of $V_2$, this allows energy to be transferred from the latter to the former, thus producing reaction. An increase in the capacity of C intensifies the reaction effect. Switching over to the last stud connects the grid of $V_1$ to the anode of $V_3$, thus giving reverse reaction, which is a means of stopping self-oscillation without the use of a potentiometer, and is, in the opinion of the writer, a far better method.




### Grid Control.

A little digression on the use of the potentiometer may help to make this clearer. A potentiometer stops self-oscillation when it causes the grid of the valve connected to it to become slightly positive, thus attracting to itself a number of electrons which would otherwise go to the anode. This sets up a current in the grid circuit and this grid current increases the damping of the grid circuit, thus stopping self-oscillation and at the same time diminishing the strength of the received signals. From this it will be seen that reverse reaction is preferable.

Of course, one of the much advertised three-electrode variable condensers could be used in place of C and S, the semi-circular vane being connected to the grid of $V_1$, and one of the quadrants to the anode of $V_2$ and the other to the anode of $V_3$. The action of this is too obvious to need explanation.

Resistance reaction can be accomplished by the substitution of a variable grid leak, of about 6 megohms maximum, for the condenser C.

A telephone condenser should not be used in conjunction with these methods of reaction as it would form a short-circuit for radio-frequency currents.

# FILES AND FILING.

(*Continued from page 260.*)

Another very useful experiment is to select a piece of steel or brass about 1 in. square, and then file it down all round until one-thousandth of an inch (0.001 in.) has been removed from each surface. People often start on this test with a dead smooth file, but when an hour has elapsed, begin to get a correct idea of dimensions, and then choose a rough file to remove what appears to be an infinitely small amount, but which in reality is quite a lot to take off a big surface by filing. The test is useful to show the amount of time that may be wasted in constructional work, by leaving too much to what is usually termed finishing operations.

DRAW FILING AND FINISHING.—Nothing mars the appearance of an otherwise nice-looking job than the presence of a lot of irregular file marks on metal that is capable of a high degree of finish. One sees various forms of wireless sets, embodying very great technical knowledge, but characterised by workmanship that makes one's heart ache. This need not be so if amateurs would only spend a little more time in studying the elements of such processes as filing, and others which I propose dealing with in subsequent articles.

As soon as the work to be filed has been reduced to the proper dimensions, the surface can be made respectable by what is termed "draw-filing," for which one holds the file as shown in Fig. 4, and moves it in the directions shown by the arrows. This produces regular file marks, which, if so desired, can be totally eliminated by covering the file with a piece of smooth emery cloth. If one uses emery cloth on a surface disfigured with irregular file marks, the latter will take a tremendous time to eradicate, but the emery will follow the marks produced by the draw-filing, and reduce them very quickly.

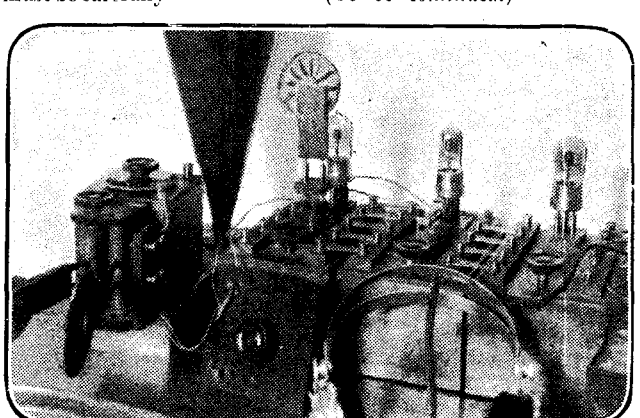
### Frosting.

There is one thing which must be carefully observed in draw-filing, however, and that is the defect known as "picking up," which is caused by particles of metal sticking in the teeth of the file, and scratching the surface of the metal. These scratches go very deep, and can only be removed by further filing. The secret of their avoidance is to keep the file teeth clear by means of a scratch brush, which will remove any bits of metal tending to clog the teeth.

A very fine effect can be produced by the process known amongst tool makers and instrument fitters as "frosting." This is done by holding the file as shown in Fig. 4, but instead of drawing it in a straight direction, it is worked with small circular sweeps, so that the teeth of the file produce an effect shown in Fig. 5.

The movement requires a lot of practice to get really good results, but it is worth while to try it, because it gives a note of distinction to the work. A similar effect may be obtained by holding a piece of round wood, $\frac{3}{4}$ in. diameter, in the chuck of a hand drill, and covering the end with grinding paste, but the finish provided by file frosting is generally to be preferred.

(*To be continued.*)



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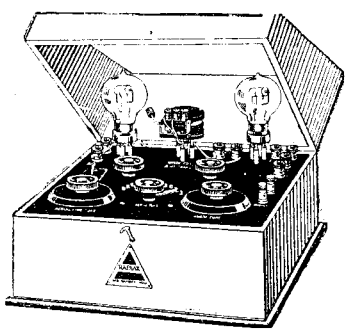

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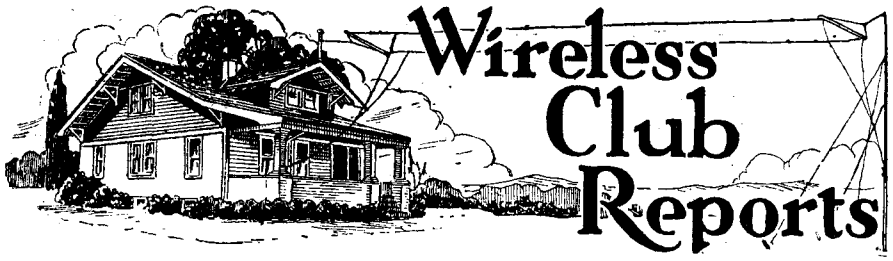



**The Editor will be pleased to publish concise reports of meetings of Wireless clubs and associations, reserving the right to curtail the report if necessary. Hon. secretaries are reminded that reports should be sent in as soon after a meeting as possible. Reports sent in cannot appear in this paper in less than ten days after receipt of same. An asterisk denotes affiliation to the Radio Society of Great Britain.**

**North London Wireless Association.***

On Monday, Sept. 17th, the 142nd meeting of this association was held, when a lecture was delivered by Mr. Hindeley on transformers.

Members are requested to note the change of the hon. sec. of this association.

Hon. sec., G. F. Irvine, 46, Albion Road, Stoke Newington, N. 16.

* * *

**Tottenham Wireless Society.**

The monthly demonstration night of the Tottenham Wireless Society was occupied by a brief exposition of reflex circuits by Mr. J. Kaine-Fish.

Other members then came forward and, using the club's apparatus, fitted up reflex circuits of their own design.

Hon. sec., S. J. Glyde, 137, Winchelsea Road, Bruce Grove, Tottenham, N. 17.

* * *

**Barnet and District Radio Society.**

There was a record attendance at the last meeting of the society's winter session, held at the Radio Clubroom, Bells Hill, Barnet, on Wednesday evening, Sept. 19th, and the gathering proved one of the most interesting of the session.

The club's 3-valve set was partially dismantled, and Mr. C. E. Green, who, with Mr. J. Finch and his son, carried out the construction of the set, thoroughly explained each of the five units.

A 3-valve "Armstrong Super," exhibited by Mr. W. Watson Baker, the son of the society's president, greatly interested the members. It was tested on a frame aerial, but, owing to the bad screening effect of the galvanised iron on the roof and walls of the clubroom, combined with the extreme sensitiveness of the circuit, it was a matter of great difficulty to secure signals of a high degree of purity.

Hon. sec., J. Nokes, Sunnyside, Stapylton Road, Barnet.

* * *

**The Leeds Radio Society.***

The third annual general meeting was held at the headquarters, the Woodhouse Lane U.M. Church Schools, Leeds, on Sept. 21st, A. M. Bage, Esq. (president), being in the chair. The annual report of the committee upon the proceedings of the session 1922-23 was read and approved.

The report states that nineteen general and eighteen instructional meetings were held, at which thirty-nine papers, etc., have been given. The society visited the telegraph dept. of the G.P.O., Leeds. Experimental apparatus has been acquired, the P.M.G.'s authority to conduct experiments with sending and receiving apparatus having been obtained. The transmitting permit authorises the use of a 10 watt, C.W., T.T., R.T., and spark set, on wave-length of 150 to 200 metres inclusive, to be operated at the headquarters, using the call sign 6 U M.

The following elections to office were made: President, A. M. Bage, Esq.; vice-president, A. F. Carter, Esq., A.M.I.E.E.; hon. sec., D. E. Pettigrew; hon. treasurer, R. E. Timms. Committee members: Messrs. J. Croysdale, J. O'Donohoe, T. Brown Thomson, S. Kniveton, F.R. Met.Soc., W. G. Marshall, H. J. Wray, and E. M. Washington.

The name of the society was altered from the Leeds and District Amateur Wireless Society to The Leeds Radio Society. The rules of the society were entirely revised. After other business had been discharged, the meeting terminated.

Hon. sec., D. E. Pettigrew, 37, Mexborough Avenue, Leeds.

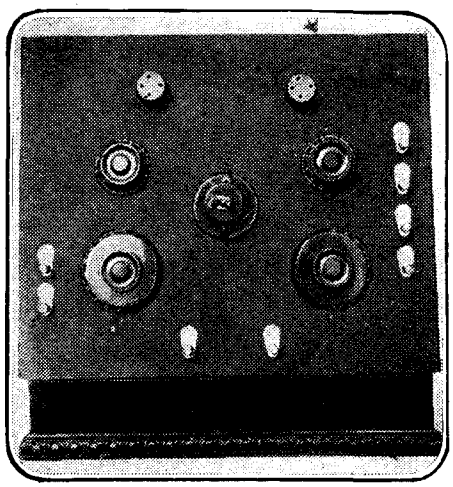
* * *

**Sydenham and Forest Hill Radio Society.**

An interesting lecture was given by Mr. R. J. Stanley before the members of the above society on Monday, Sept. 10th, at 8 p.m., on "Inductance and Capacity."

Mr. R. J. Stanley gave an explanation of the general principles of the above subjects, using various mechanical analogies to illustrate his points.

Hon. sec., M. E. Hampshire, 139, Sydenham Road, S.E. 26.



**The "P.W." Combination Set as constructed by Mr. A. W. Stanbrough, 148, Clements Rd., East Ham, E.6.**

# Catalogues Book Reviews Etc.

A fully illustrated catalogue of components has been forwarded to us by the Sterling Telephone & Electric Co., Ltd. All this apparatus is well made and, of course, thoroughly efficient. The head telephones are probably the most interesting accessories illustrated, and they are certainly very sensitive and extremely comfortable.

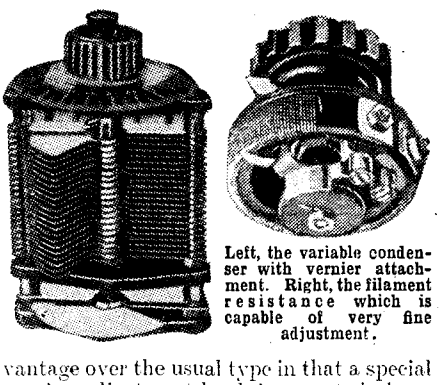
It, however, does not seem necessary to mention this, considering the many years' experience that this firm has had in the manufacture of telephones. A separate pamphlet describing the new Sterling Baby Loud Speaker should prove interesting to those who want a loud speaker with the same tonal quality as obtained with the larger Sterling models, but at a greatly reduced cost. We have also received an unabridged catalogue of Sterling apparatus which has been specially prepared for the trade.

* * *

We have received an interesting leaflet from Elwell Wireless, Ltd., Craven House, Kingsway, London, W.C., descriptive of the well-known Elwell Universal Tuning Units. These pieces of apparatus are not only both useful and neat in appearance, but are fully guaranteed for one year. Twenty-five shillings seems quite a moderate charge. They can be used, together with Elwell plugs and jacks and a few other small components, for the construction of the "P.W." Combination Set. Details of this appear in the correspondence columns of this issue.

* * *

It is often found that, when using various super circuits, the control of the filament current is very critical, and the least adjustment of the resistance will cause the set to howl. In such a circuit a filament resistance, such as that forwarded for our inspection by Gamages, should prove very handy. This resistance is extremely neat in appearance, and has the additional advantage over the usual type in that a special vernier adjustment knob is mounted above the usual knob.



**Left, the variable condenser with vernier attachment. Right, the filament resistance which is capable of very fine adjustment.**

Another interesting piece of apparatus forwarded by the same firm should also meet with general approval. This is a variable condenser which, like the resistance above, also has a second knob for vernier adjustment. With each instrument is supplied a template for locating the holes in the panel when mounting the apparatus.

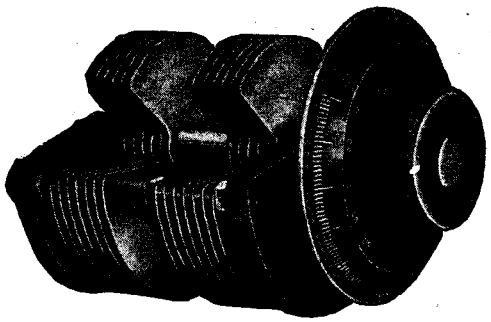
* * *

Siemens Bros. & Co., Ltd., have lately issued a new catalogue of accessories for private wireless installations. All these accessories are fully described, and the catalogue is well illustrated. Telephones, loud speakers, lightning protectors, fuses, plugs, jacks, and the famous Siemens H.T. battery are only a few of the many interesting things illustrated in this catalogue.

* * *

Some interesting complete two to five valve sets are described in a catalogue which has come to hand from Percnet Ltd. These sets, which are known by the trade name of "Pelmerset," are very moderately priced and neat in appearance, and yet extremely efficient. The five-valve instrument can be supplied in a handsome Jacobean cabinet with loud speaker and a full set of loading coils. Amplifiers for the above sets are also described in this catalogue.

# *"As good as the best!"*



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Realising the difficulty of tuning a circuit in which two stages of tuned anode H.F. Amplification is used, we have designed the "DUANODE" Condenser, as illustrated. This Condenser consists of TWO matched Condensers, operated by one knob, thus by using matched COILS it is possible to tune BOTH Circuits perfectly with one operation only. The two sets of Fixed Vanes are carefully insulated one from the other, and the moving Vanes connected electrically; the spindle can thus be connected to H.T. Positive. This Condenser can also be used for other purposes. The two halves (each of ·0002 mfd.) can be used in series or parallel, giving capacities of ·0001, ·0002 and ·0004. Price **25/-**

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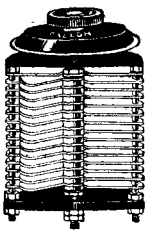

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in polished mahogany case. Construction as Type A I in celluloid case).

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|---|---|---|
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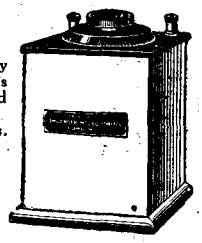
| ·0005 .. | 11.9 | 29 |
| ·0003 .. | 10.3 | 19 |
| ·0002 .. | 9.3 | 13 |
| Vernier | 6.6 | 5 |
| " | 5.6 | 3 |



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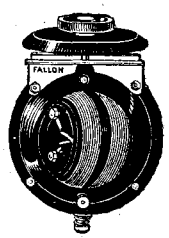
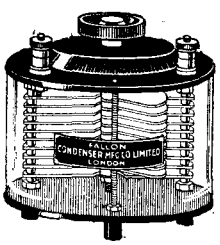



## TYPE A I CONDENSER

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|---|---|---|---|---|---|
| ·001 .. | 17.6 | .. 57 | ·0005.. | 15- | .. 29 |
| ·0003 | 13.9 | .. 19 | ·0002.. | 12.6 | .. 13 |
| Vernier | 8.6 | .. 5 | Vernier | 7.6 | .. 3 |

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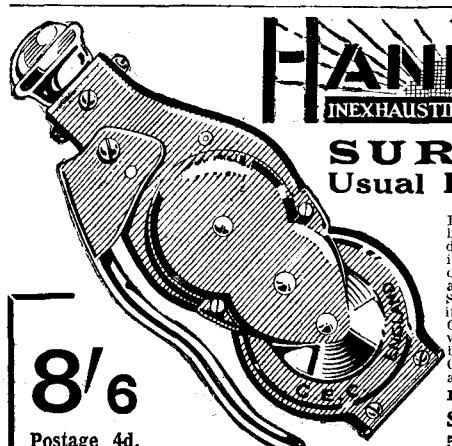

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# RADIOTORIAL.

All Editorial Communications to be addressed The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

Listeners-in do not seem to have been in a violent hurry during the last few days to avail themselves of the generous offer of the P.M.G in the matter of licences.

Unless the Post Office estimation is far from right when they say there are about 200,000 "pirates" in existence, it looks as though a good many people still intend to risk heavy penalties and forgo the paying of a licence fee.

The Post Office continues to give out dark hints as to what will happen if offenders are caught, and according to the daily Press there is a "dark" horse at the G.P.O. who has some subtle scheme up his sleeve for spotting amateurs who continue to listen-in minus a licence.

Those who have yet refrained from treating themselves to one of the new wireless licences, would be well advised to curb that restraint and get one quickly.

There is no sense in looking a gift horse in the mouth: worse things might befall if the P.O. "dark" horse suddenly gets busy and people find themselves fined heavily for evading the law.

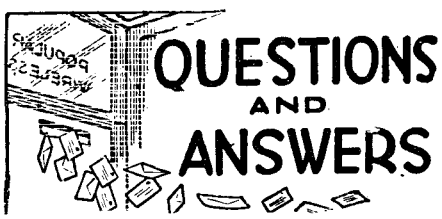
After all, we are not sufficiently civilised to expect with any degree of justice, to get something for nothing, and my advice to all "pirates" is—strike your flags in preference to walking the plank.

THE EDITOR.

---

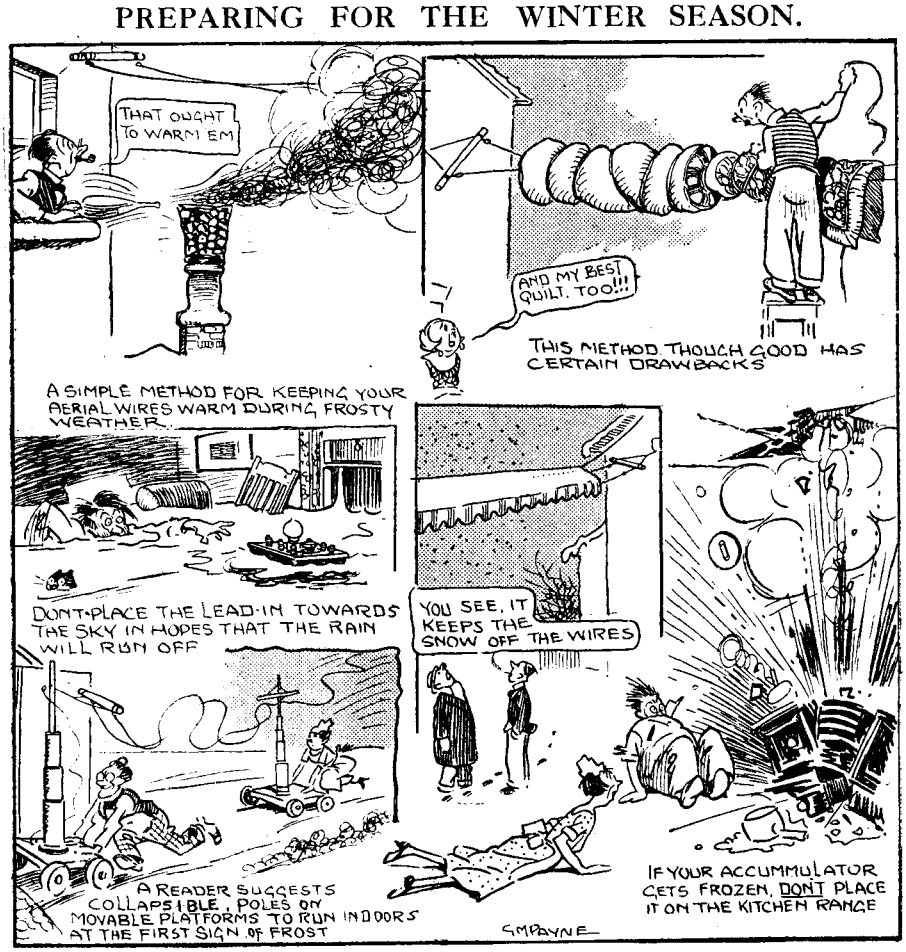
**Owing to the enormous number of queries received daily from readers of POPULAR WIRELESS, we have temporarily decided to limit the number of questions sent in by one reader to three. Readers are asked to keep their questions as short and as concise as possible in order that the minimum of delay can be exercised in answering queries. Until further notice three questions from one reader will be the limit for one letter. All questions should be addressed to POPULAR WIRELESS Queries Department, Room 138, Fleetway House, Farringdon Street, London, E.C.4.**

**Readers are requested to send the necessary postage for reply.**




*The Editor desires to direct the attention of his readers to the fact that, as much of the information given in the columns of this paper is of a technical nature and concerns the most recent developments in the Radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.*

## PREPARING FOR THE WINTER SEASON.


THAT OUGHT TO WARM 'EM
AND MY BEST QUILT, TOO!!!
THIS METHOD THOUGH GOOD HAS CERTAIN DRAWBACKS
A SIMPLE METHOD FOR KEEPING YOUR AERIAL WIRES WARM DURING FROSTY WEATHER.
DON'T PLACE THE LEAD-IN TOWARDS THE SKY IN HOPES THAT THE RAIN WILL RUN OFF
YOU SEE, IT KEEPS THE SNOW OFF THE WIRES
A READER SUGGESTS COLLAPSIBLE POLES ON MOVABLE PLATFORMS TO RUN INDOORS AT THE FIRST SIGN OF FROST
IF YOUR ACCUMMULATOR GETS FROZEN, DON'T PLACE IT ON THE KITCHEN RANGE
C.M.PAYNE

H.E.K. (Clapton).—My receiving set is on the third floor, and I wish to receive simultaneously on the ground floor. Can I use the same aerial, or must it be a separate one? I am using a crystal set with signals of fairly good strength.

There are several ways of working the two sets, and you will probably be able to judge for yourself which will give best results in your particular situation. If the aerial is a fairly good one, and the construction of the building permits, the lead-in can be tapped from the point where it enters the top room and continued to the ground floor. Signals on the top floor would be somewhat weaker. Failing this, two separate aerials on the same spreader can be tried, but the spreader should be a wide one and the wires not less than seven or eight feet apart. If the broadcasting from 2 L O only is required, it might be the easiest way of all to extend the present 'phone-leads to sockets wired in parallel with them on the ground-floor. When desired, the lower pair of 'phones could be plugged in. In this case, if the lead is a fairly direct one, the signals would not be much weaker when the second pair of 'phones is plugged in across the 'phone terminals.

* * *

"Rex" (Cardiff).—How can I tell the approximate natural wave-length of my aerial, which is 90 ft. in length? What should be the weight of one square foot of ebonite?

The natural wave-length of your aerial is approximately 123 metres. This is found by multiplying the length of the aerial plus its lead-in by 4·5. This, in your case, would be 405 ft., or 123 metres, since there are approximately 3·3 ft. to a metre. The weight of the ebonite will, of course, depend on the thickness, which you have omitted to state. As you are probably using either ⅛ in. or ¼ in. thick, the weight of one square foot of the first is 13 oz. and of the second is 26 oz.

* * *

J. W. F. (Richmond, Surrey).—I am installing a three-valve set. What capacity accumulator should I buy, and do I add plain water to make up for evaporation?

You should use a 40 or 60 ampere-hour battery. Do *not* add ordinary water, as there are invisible impurities, such as sulphates of various salts, in clear water which affect the cells harmfully by setting up local action or forming chemical substances. Use distilled water only to make the specific gravity up to 1·2. Do not add too much water, but keep its level well above the plates.

* * *

S. B. D. (Mill Hill).—With regard to the "Duplex Reflex" circuit that was published recently in Popular Wireless, I have made up a set conforming to that circuit, but find that, though signals are beautifully clear, they are not so loud as I expected. It will work a loud speaker, but only sufficiently to be heard a few feet away; the signals do not fill a room by any means. Can you suggest any remedy?

Make sure that the H.F. transformers are wound with fine wire, about 38 or 40 D.S.C., and that they have the correct number of turns. The L.F. transformer connections should also be overhauled and the primary connection changed over if necessary. Finally, the L.T. battery *external* connection should be changed over, the plus L.T. going to the L.T. minus terminal. This latter change very often has a marked effect upon signal strength.

* * *

P. W. C. (Bournemouth).—How many plugs and jacks are required in unit two of the "P.W." Combination Set?

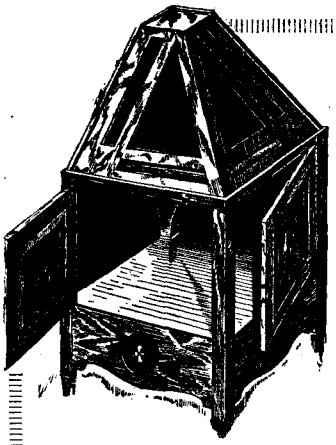
In unit two, one plug and one jack will be required. The jack is connected between plate and H.T.+, so that the 'phones may be plugged in when this unit is in operation. The plug is connected across the primary windings of the transformer, so that it may be plugged into either jack No. 1 or jack No. 2 of unit one, according to where the extra amplification is required.

* * *

W. W. (Bourne End).—I am situated about twenty-five miles from London as the crow flies. I wish to construct a three- or four-valve set for use with a small Amplion loud speaker. Do you consider that the three valves will be sufficient? I intend using dull emitter valves.

The three valves should give quite fair results in a small room, but of course the fourth valve would make a lot of difference. We should therefore advise in your case four valves, including one H.F. with tuned anode coupling and reaction on the anode coil. You will then be able to tune in distant stations as well as London.

(*Continued on page* 268.)



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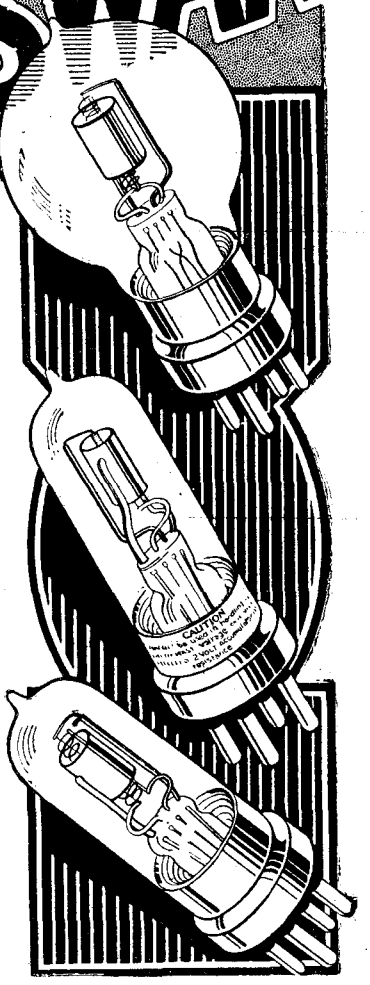
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| | | |
|---|---|---|
| Filament Volts | .. | 1·8–2·0 |
| ,, Current | .. | ·30 |
| Anode Volts | .. | 20 – 50 |
| Bulb Diameter | .. | 29 mm. |
| Overall Length including pins | } | 110 mm. max. |
| Cap | .. .. | Standard 4-pin |

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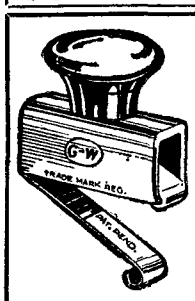


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# RADIOTORIAL QUESTIONS AND ANSWERS.

(*Continued from page 266.*)

"CONDENSITE" (Berwick).— What are the specific inductive capacities of (1) shellac, (2) ebonite, (3) paraffin-paper, (4) plate-glass. What is meant by dielectric constant?

Shellac is approximately 3; ebonite 2·75; paraffin-paper 2·5, approximately; and plate-glass 8·5. Dielectric constant has the same meaning as specific inductive capacity.

* * *

W. N. H. (Knutsford).—My house is situated right on the main road, and my cat's-whisker is being continually dislodged by heavy traffic passing. Is there any method whereby I can keep the sensitive point?

There is no satisfactory method of doing this, but I advise you to dispense with your present crystal and use one of the Perikon type, which you will find to be much more stable.

* * *

P. X. V. (Banbury).—I have a Stirling new type variometer. The wave-length is supposed to be 250-2725 metres, when used in conjunction with a variable condenser. What capacity should this condenser be, and what are the various combinations to give the above wave-lengths? Is a series parallel switch necessary?

A series parallel switch is advised, and will save much time and trouble. The condenser used should be a variable one of ·0005 mfd. When the rotor and stator are in parallel, the wave-length will be 250-700 metres with the condenser in series, while with no condenser at all the wave-length is 370-940 metres. To increase these wave-lengths, place the rotor and stator in series. Now with the condenser in series you will be able to tune from 530-1340 metres, or 975 to 2,725 metres with the condenser in parallel. With no condenser and with the rotor and stator in series the wave-length is 730-1850 metres. These wave-lengths are with a standard P.M.G. aerial.

* * *

S. N. T. (Aylesbury).—What size formers and what wire and number of turns do I require for a loose coupler to tune from 300 to about 1,000 metres?

For the primary you will require a former 4½ in. in diameter, wound with 280 turns of 28 S.W.G. and with 20 tappings. For the secondary, wind about the same number of turns of 30 S.W.G., taking 12 tappings on a 3-in.-diameter former.

* * *

L. N. C. (Malvern).—Using mica as dielectric, how many foils shall I need for a fixed condenser to go across the 'phones on my crystal set? What capacity will this condenser be? Can celluloid be used as dielectric? If so, what is its specific inductive capacity?

You will find that a ·001 fixed condenser will be O.K. for this. You will require 6 foils with an overlap of 2 by 1 cms. Celluloid makes quite a good dielectric, and has a specific inductive capacity of approximately 1·5.

* * *

A. Z. (Lewes).—What exactly is meant by reaction? How can it be applied to a single-valve set so that it does not cause interference to other amateurs?

By reaction we mean the feeding back of the energy, or part of the energy, from the plate of a valve to the grid of the same or another valve. Thus it is possible to greatly magnify the original energy applied to the grid, and signals are, of course, correspondingly increased in volume. This is usually accomplished by coupling an inductance placed in the plate circuit of a valve (which will thus carry the anode output) to another inductance which is feeding the grid of the same or a different valve. In the case of a single-valve set, this energy will have to be fed back to an inductance which will be either directly in the aerial circuit or, in the case of a secondary coil, will be inductively coupled to a coil in the aerial circuit. Thus the aerial will be energised, and it will be seen that it is impossible to use reaction in a single-valve circuit that will not cause interference. In the case of a two-valve circuit (using a stage of H.F.), however, the inductance placed in the plate circuit, as mentioned above, may be coupled to the inductance or transformer which is used to couple the second valve to the first, and this inductance not being directly or indirectly in the aerial circuit, it is thus unlikely to energise the aerial.

## THE "P.W." COMBINATION SET.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have been experimenting for some time with "dual" circuits, and had produced something really "hot stuff" in this direction, one valve working a small loud speaker within a fifteen-mile radius of the London station and bringing in *all* other stations with headphones. The only fly in the ointment was, the 'phones being directly in the H.T. circuit, they suffered somewhat when the large-capacity fixed condenser decided on one occasion to let the H.T. current go its way unmolested. Then this set could hum and howl real and good, unless one was extremely careful.

I thought of sending you full details of this set, since its range and power was really wonderful and its first cost and upkeep exceedingly low.

However, along came the description of the "P.W." Combination, and I decided your big noise was reserved for your own baby, and I carried on, selfishly permitting only the elect to listen to Mr. Carruthers trying to drown the voice of Mr. Burrows.

Week by week the "P.W." was forced to my notice, and the other week the booklet shouted that I must try out this circuit.

I commenced. Wire was ruthlessly torn from "pieces" on my experimental board, and presently phœnix rose from the ruins in the shape of the "P.W." (dual only). I wired a Junior Amplion in the place where the 'phones ought to be, and turned on the tap—that is, pulled over the aerial switch.

Truly the result amazed me, the small loud speaker easily and perfectly filled a room 16 ft. by 13 ft., and with no distortion. I should explain that I departed slightly from your circuit by inserting a basket coil between the H.T. positive and its terminal, sliding this coil over the anode coil; this simple reaction causes no distortion or interference and greatly adds to signal strength.

I am looking forward to many more letters on the subject of the "P.W." set in your valuable journal, and I intend to complete the set in all its detail and give it a thorough try out this winter.

Yours faithfully,
R. H. COWTAN.

## A RE-RADIATION TEST

The Editor, POPULAR WIRELESS.

SIR,—Having seen in the correspondence column of a recent issue of POPULAR WIRELESS the item "Effect Between Aerials," I might mention an interesting little test I have carried out concerning same.

I am using one valve, employing reaction, my aerial being 38 ft. in height, and by fixing up temporary aerial to crystal set about 3 yards away I can receive all the British broadcasting stations, with the exception of Glasgow, also Paris. The strange thing is that it comes through with the same strength as the valve set.

No wonder we hear of so many people getting extraordinary results on crystal sets.

(*Continued on page 269.*)

## CORRESPONDENCE.

(*Continued from page* 268.)

People would do well if before coming to the conclusion that their set is a super set they would find out if their neighbours have got multi-valve sets. I think this is what happens in the majority of cases. I would be very grateful if you would insert this in next week's POPULAR WIRELESS.

Yours respectfully,
G. WALKER.

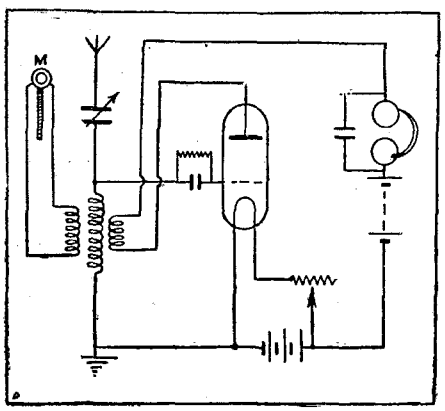
37, Colville Road, South Acton,
London, W.3.

### A SIMPLE TELEPHONY TRANSMITTER

The Editor, POPULAR WIRELESS.

SIR,—As a reader from the first number of your valuable weekly, I am sending the following, and hope you can find a corner for it, as I am sure it will interest the experimentally minded readers.

I made an ordinary reactive 1-valve set and put a microphone in the earth lead. On speaking into same I found that a friend of mine about a mile away could hear me. I then tried a third coil (with microphone across) inductively coupled to the aerial and reaction coils (three-coil holder) and found




that I got better results still. I told a friend of my discovery, and he did the same. I then found that by "picking up" each other's "carrier wave" we could carry on a conversation as easily as with an ordinary telephone line and without *changing over*. Hoping this may interest you,

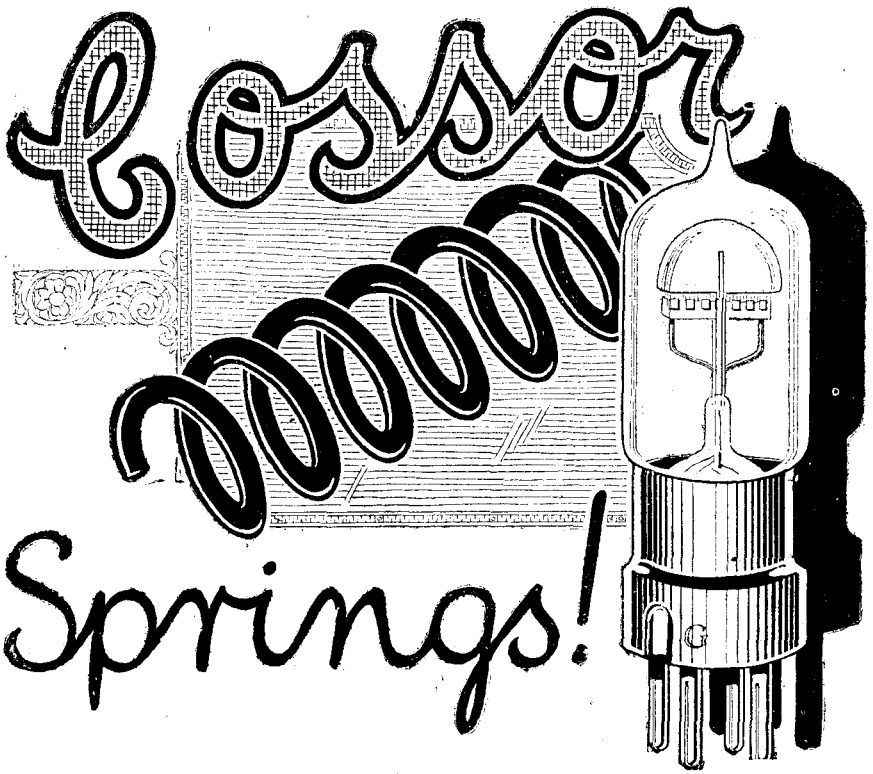
Yours faithfully,
C. S. FROST.

Doncaster.

### LONG-DISTANCE RECEPTION.

The Editor desires to thank the following readers for their interesting letters concerning the reception of U.S.A. broadcasting stations and other long-distance performances, but regrets that space will not permit him to reproduce them in these columns:

M. F. RAYNER, Farringdon Road, E.C.1.
F. T. HALL, Marton, near Daventry.
LESLIE BROADHURST, Manchester.
J. H. BRITTAIN, Patricroft.
S. R. SENTAN, Northampton.
C. P. BARWELL, near Birmingham.
ERNEST BURTON, Margate.
R. W. DUCKWORTH, Yorkshire.
H. G. HERSEY, Lee, S.E.13.
J. G. RITCHIE, Glasgow.
C. R. BATES, Bucks.
S. E. WARREN, Haywards Heath.
P. L. SMITH, North Finchley.
S. W. HULL, Colchester.
M. C. BOOTH, Manchester.
J. STEPHENSON, Perth.
"C. S.," Pontypridd.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Now in every Valve—except the **COSSOR**—some device is necessary to take up this slack, otherwise the filament will quickly sag, and touching the Grid, put the Valve out of action.

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This is why on any other Valve but a **COSSOR**—it is dangerous to switch the current on or off suddenly. Any rapid expansion or contraction quickly finds the weak spots in a filament and causes a fracture.

There are no springs in the **COSSOR** Valve. On the contrary, its filament is supported, like the arch of a bridge, by stout electrodes. This unique principle is responsible for a remarkably long life with complete freedom from the risk of breakdown due to the filament touching the grid. Remember that—for all these exclusive features the **COSSOR** costs no more than ordinary Valves.

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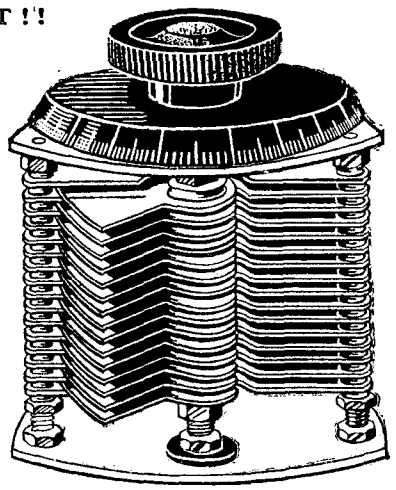

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| 6 v. 80 amp. (Oldham) | 35/- |
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| 60 v. | 9/6 |
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| 2-way ... first quality 6/6, second do. 5/-, third do. | 4/6 |

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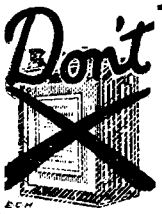


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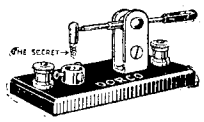

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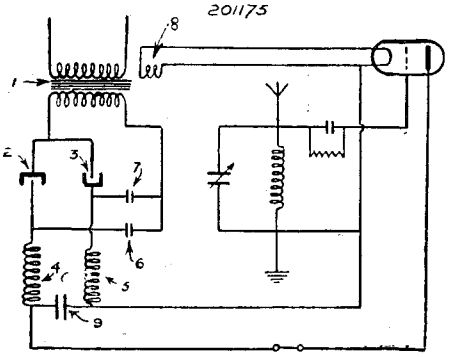
# Recent Wireless Inventions

**The following abstracts are specially contributed by Mr. Harold J. C. Forrester, Fellow of the Chartered Institute of Patent Agents, 88-90, Chancery Lane, W.C.2.**

Grant of the following patents can be opposed, and printed copies of the full specification obtained.

**201,175.—COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATERIAL D'USINES A GAZ.—CONVERTING CURRENTS.**—Continuous current for valves is obtained from alternating current by means of electrolytic rectifiers with sets of smoothing inductances and capacities. Thus current from mains would




be supplied to a transformer, 1, and through rectifiers, 2, 3, with smoothing inductances, 4, 5, and condensers, 6, 7, 9, to the valve anode, an auxiliary winding, 8, supplying the filament current.

**201,249.—W. S. SMITH.—INSULATION.**—Free carbon is removed from coal tar pitch or gas pitch by solution, and the filtration, added to gutta percha, balata, etc., forms a non-oxidising, insulating composition. Two parts of gutta percha to one of pitch are suitable.

**201,250.—C. HOLT.—VALVES.**—The plate is made of sheet metal bent to box form, such as an inverted U open at the sides and bottom, and encloses in turn a similarly shaped grid and a straight or hooked filament.

**201,264.—E. Y. ROBINSON.—AERIAL MASTS.**—Masts are made in insulated segments, and are graded so that the potential drop is approximately uniform from aerial to earth. The guys are similarly segmented or graded, the desired distribution being obtained by suitable dimensions of sections and capacity coupling between them. Aerials so mounted are said to be suitable for wireless transmision of power.

**201,308.—BRITISH THOMSON-HOUSTON CO., LTD. & E. G. PARROTT.—PROTECTIVE COUPLINGS.**—Sparking-plug couplings, etc., on aircraft, etc., are provided with metal covers to prevent interference with wireless apparatus.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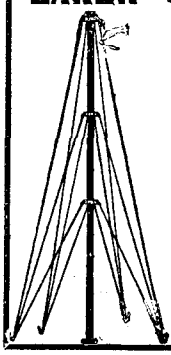

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